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# The Development and Testing of Potential Music Piracy Warnings

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# THE DEVELOPMENT AND TESTING OF POTENTIAL MUSIC PIRACY WARNINGS

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**Abstract**

A combination of technological, legal, and economic factors necessitates efforts to protect music from being illegally reproduced in a globally digital environment. Entities such as record companies, recording industry organizations, and special governmental agencies are committed to eradicating the unauthorized dissemination of copyrighted material. Furthermore, the FBI provides an official anti-piracy icon with accompanying text to be placed on websites and packaging. In support of these initiatives, the principal goal of this study was to empirically identify icon design elements that will most successfully communicate to consumers the illegality of unauthorized music reproductions.

Recommendations from extant literature indicate that viewers must attend to and understand graphic warning systems, before compliance to instructions is achieved (Laughery & Wogalter, 2001). Therefore, a set of icons informing viewers to not illegally download and/or upload music was tested. The chosen symbols illustrated specific concepts portrayed within this target message: context (*computer, no computer*), action (*download*, *upload, download/upload, control*), prohibition (*cross*, *slash*, *control*), and illegality (*badge*, *bandit*, *control*). All 72 symbol combinations included an eighth note symbol to denote music.

Using a sample of 138 university students, comprehension was analyzed using open ended questions, and subjective ratings of understandability, attention, compliance, and carefulness. Results mainly showed that the single addition of symbols denoting context, action, prohibition, or illegality symbols notably appeared to increase interpretation accuracy. Respondents interpreted the conventionally used symbols for *download* (down arrow), *upload* (up arrow), and *prohibition* (slash) more accurately. Moreover, interpretation accuracy increased with the *bandit* symbol as compared to the *badge*. Although the badge was inferred to connote

safety and security, the bandit appeared to provide a more direct connection to the concept of illegality. Nonetheless, results from Study 1 indicated that only 4 of the 72 created icons were interpreted correctly by at least 67% of the respondents.

Study 2 investigated the performance of these four icons when combined with textual messages containing a signal word, a message about illegality, and consequences using a sample of 220 university students. The consequences included statements about being fined and being monitored. Respondents consistently gave the highest rating to the icon that included a computer for context, a *download* symbol, a *slash* prohibitive symbol, the signal words STOP or IMPORTANT, and message with greatest explicitness, which consisted of both being fined and being monitored, with regards to perceived understandability, attention, carefulness, compliance, and representativeness. The lowest ratings were consistently given to the icon with a *cross*, a *download/upload* symbol, NOTICE, no consequences, and no computer.

Ratings for each of the other measured dimensions increased when icons contained all tested message components. Furthermore, icons that were most understandable included elements commonly used in other instructional or warning signs, thus indicating the strong impacts of past experience on comprehension. Perceptual fluency is proposed to drive comprehension.

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**Why We Need Warnings for Music Piracy**

Music has a strong affective and commercial influence on American culture. Obtaining favorite selections through the purchase of CDs may be a costly endeavor for some consumers. Yet, technological advances, perceptions and attitudes of consumers, and our appeal for music contribute to the widespread infringement of copyright laws. Hence, sound recordings were one of the first forms of media subjected to excessive infringement violations since the launching of the World Wide Web (Hong, 2007).

The sharing of illegal music worldwide, costing an estimated 40 billion dollars, has caused great alarm for creators, distributors, and legislatures (IFPI, 2009). Along with dramatic declines in revenue, record companies have reported severe employment losses due to music piracy. Therefore, leaders in the creative, technological, and public sectors have convened at both national and international levels to develop strategies and policies toward the eradication or mitigation of economic harms caused by copyright infringement. Thus, intellectual property protection is addressed by federal crime enforcement agencies with the highest priority as demonstrated by the recent instatement of the Office of the U.S. Intellectual Property Enforcement Coordinator (IPEC).

There are several factors that render infringement through file sharing a unique and complex situation (Lemley & Reese, 2004). For instance, an Internet piracy operation is distinct from previously conventional forms of infringement, because the creators or users of such software may not receive financial compensation for their efforts. Furthermore, peer to peer networks (P2P) are accessed through Internet portals, whose providers are termed Internet Service Providers (ISP), and no longer require the use of cumbersome hardware such as desktop computers for participation. Users can now get online through the latest released mobile and portable multimedia devices from virtually anywhere. Unlike preceding forms of intellectual property theft, Internet piracy is sustained by a complex web of forces prompting courts to sort various infringement conditions into primary, secondary, and tertiary liability. Primary liability relates to those who directly upload and download illegal material. Secondary liability is associated with enablers of infringers who directly engage in the behavior (e.g., owners of P2P sites). Those who 'enable the enablers', such as Internet Provider Sites or investors of technology and software allowing these illegal activities, may be subject to tertiary liability (Lemley & Reese, 2004).

Many types of intellectual property can be exchanged within the masses through P2P sharing sites. Yet, there are certain factors that differentiate music piracy from others. For example, previous to illicit music sharing, much research has focused on the forces related to software piracy. Because both types are committed by technologically savvy adolescents, there is a connection between music and software piracy. However, the main differences between these two forms of digital files depend on the size and function (Chiang & Assane, 2002). For instance, legitimately purchased software is more expensive and requires specialized skill for use than legitimately purchased music. In contrast, music can be enjoyed with ease once downloaded. Software requires a large amount of space and therefore lacks the portability and accessibility that compressed music files (MP3s) possess. Although software is obtained by students or other perpetrators for practical reasons, music is widely used for self-serving, entertainment purposes (Kinnaly et al., 2008). For example, some researchers have associated music's effects on the social and emotional development of adolescents, which helps explain adolescents' strong affinity for pop music (Saarikallio & Erkkila, 2007). Regardless of the motives, the potential for copyright infringement is strong due to a combination of social, environmental, and technological conditions.

Copyright infringement, or Internet piracy, has been the focus of many contentious debates particularly over the last few years. Congress currently is in the process of examining bills aimed at providing amendments to the constitution that will help counteract crimes associated with copyright and with cybersecurity in general. The most recent proposals to Congress include SOPA (Stop On line Piracy Act), OPEN (Online Protection and Enforcement of Digital Trade Act), and CISPA (Cyber Intelligence Sharing and Protection Act) (Hayes & Kesan, 2012).

The ultimate outcome of these pending legislations remains unknown. However, this paper posits that there are changes occurring within the present legal, technological, and social landscape, which justify the need of a warning to deter illegal music downloading. In efforts to reduce this behavior, a warning label can be achieved through pictorials accompanied by signal words and an effective message.

The proposal for a warning label specifically for music piracy intersects several issues that will be presented in this paper. A brief introduction and history of copyright law will be followed by a review of the changes in copyright protection, technology and legislation. The second section of this paper will discuss the social and psychological factors that are associated with Internet piracy. Finally, a literature review regarding the effectiveness of warning labels in the area of risk communications will be presented in the last section.

## Copyright Law

The first U.S. copyright laws were intended to stimulate creativity by granting rights to artists over their original works (U.S. Const. art. I, § 8). The 1787 Constitution of the US was adopted, declaring that: "The Congress shall have power to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Exclusive rights of authors and copyright holders include the reproduction and sale of works, the right to import and export the work, to create derivative works, to perform or display the work publicly, to sell and assign rights to others, and to transmit or display by radio or video.

Any form of creative expression or intangible assets such as musical, literary, and artistic works, is regarded as intellectual property. Copyright laws create a mutually benefitting system between creator and society by providing artists and inventors exclusive rights to their respective writing and discoveries for a limited period of time. After the protection period elapses, the work is placed under public domain, where it is available to the public for alterations or application without the legal obligation of paying fees or royalties to the original creator or copyright holder. Thus, innovation is supported by the ability to generate new works from those held under public domain. The compensation due to artists and creators were intended to be used as an incentive to produce and provide a means of living for themselves, their family, and descendants.

## Changes in Copyright Protection

A comprehensive review of copyright laws, amendments, and interpretations from as early as the Medieval Ages to the present, has been undertaken by legal scholars (e.g. Sterling, 2003). In short, the law describes the types of creations considered under copyright, the length of protection, and the course of action necessary for registration. Furthermore, as copyrighted work expanded from maps, books, and charts to other forms such as prints, dramatic plays, and music, matters relating to publication and public usage of works became an issue. For instance, the protection assigned to an expanding group of contributors, such as performers, producers, and broadcasters are termed "related rights". To deal with intellectual property of new technological products, a different type of protection referred to as sui generis ("of its nature") was designated. "Copyright, related rights, sui generis rights, and other types of protections may be protected by civil remedies (action for infringement) or criminal sanctions (fine or imprisonment for making pirated copies.)." (Sterling, 2003, p. 4).

The underlying mission of the copyright laws in the original constitution was met with challenges, which became more complex as modernization progressed. In the earliest periods of copyright law, registration procedures were the central concern, because transportation systems were still primitive and locations of registries were dispersed across far distances (Cummings, 2010). Original copyright laws required creators to make their ownership known and printing companies to identify protected works. Therefore, due to the hardship and limitations that were endured to register a work and to access registration information, very few works were protected and very few people fully understood the restrictions and liberties presented under copyright law. During these early times, marking the work with an insignia indicating its ownership to an author or third party (a copyright holder), was mandatory.

But as technology and transportation systems improved, the exchange of intellectual property became a global wide enterprise. As a result, more nations recognized the potential problems and aimed to resolve them through a series of negotiations that led to the protection of works of international authors under relatively relaxed conditions. These less stringent requirements were implemented to accommodate the different registration procedures that were established in each country. Although the United States did not participate in these early conventions, it was the first international response to the global threat of copyright infringement. The gradual trend toward more relaxed guidelines for copyright registration concluded with the formal removal of compulsory procedures altogether by the 1976 Copyright Act, which officially allowed all creative works to be protected merely by its creation and fixation. Hence, permission from the United States Copyright Office was no longer necessary (Cummings, 2010). Fixation refers to the work being in a permanent environment where it can be "perceived, reproduced, or otherwise communicated for a period of more than a transitory duration." (Rose, 2002, p. 341). Under these guidelines, a song that has been created with the slightest bit of originality and set in permanent forms, received full protection. This included songs that have been scribbled on the back of a dinner napkin, hummed into a tape recorder, or recorded digitally onto a computer (Rose, 2002).

Of note, this current system is in stark contrast to the procedures that were mandated between 1790 and 1909 for obtaining copyright protection, which involved registration processes and notices on every published copy of work. The current system, involving more relaxed registration procedures, is arguably among the many influences of a less benevolent legal climate for innocent intellectual property infringers (Anthony, 2007). Along with changes in registration procedures, extensions to the duration of protection were gradually implemented over the course of history. The initial period of protection under original copyright statutes was 14 years, with the possibility of a 14-year extension. Movements toward copyright amendments have ultimately lengthened the protection to 95 years from publication or the life of author plus 50 years after the creator's death in the Copyright Amendment of 1993.

Relaxed procedures in registration coupled with extensions in copyright protection have led to less works being relegated to public domain. Some argued that the generation of new works from existing creations is hampered by the restrictions associated with requesting permissions and owing royalty fees (Anthony, 2007). Furthermore, Anthony (2007) contended that these modifications heighten exposure to unintentional infringement by individuals who are unaware of the laws.

**Current Anti-Piracy Legislation**

The No Electronic Theft Law (NET Act), added digital recordings to the types of works that are punishable for copyright violations ("Piracy online the law", 2013). Under this law, criminal penalties can run up to five years in prison and /or $250,000 in fines, regardless if the purpose did not include monetary or commercial gain. The Digital Millennium Copyrights Act in 1998 criminalized efforts intended to circumvent blocked access of copyrighted material. This applied to systems that operated on websites to prevent unauthorized access of copyrighted material including programs embedded within compact disks, which limited the transfer and download of sound recordings.

The current types of legislation that have to yet to pass in Congress are intended to supplement the existing laws ("OPEN Act", 2013). These include SOPA, OPEN, and CISPA. These laws were intended to provide guidelines to detect and investigate cybersecurity threats such as unlawful access to private databases. Laws pertaining to copyright infringement or intellectual property rights are incorporated under these guidelines. SOPA proposed the allowance of governing bodies to block access to potentially infringing sites through domain name and search engine blocking of foreign rogue sites. However, big Internet companies publicly spoke against this act, which led to its overturn. The OPEN Act proposed to block the financial network payment and advertising network revenue – which was also overturned. One of the most recent pieces of legislation that has gone through Congress is CISPA, which states that private Internet companies may voluntarily relay information important to cybersecurity to the government for investigation. This has also been attacked for the ambiguous wording, and questioned for the terms that underlie the extent to which Internet companies can share user information to the authorities (Fitzpatrick, 2013).

The rampant sharing of copyright music through P2P sites that begun in the late 1990s provoked the Record Industry Association of America (RIAA) to take drastic action. Between 2003 and 2008 it filed close to 50,000 lawsuits. Two of the biggest cases were Capitol Records v. Thomas Rasset and Sony BMG Music Entertainment v. Tenenbaum. The latest appeals of these two highly publicized music piracy cases were judged within the last several months. Thomas Rasset was ordered to pay $220,000 for 24 sound recordings (Karnowski, 2013). Tenenbaum’s fines of $67,500 for 30 sound recordings were ordered by the court in late summer of 2012. Both defendants’ requests for a re-trial at the Supreme Court level were rejected. The verdicts of these two cases confirmed that downloading music illegally is not condoned by the government and is a crime that may potentially lead to harsh penalties.

Yet the availability and uncontrolled exchange of digital intellectual property on the World Wide Web continues to reinforce the committing of copyright violations. The consumption of music through data files (MP3s) were introduced by illegal sharing sites, such as Napster, which offered an extensive list of music for users to download and share at no cost. Despite the court ordered shut down of Napster and other subsequent illegal P2P sites, these services continue to exist and entice the masses to defy the legal system. However, infringing activities are not limited to these illegal P2P sites. Legitimate P2P sites, such as Youtube, may be misused for the purposes of illegal access and sharing, which produces the need for consistent monitoring as well.  Therefore, strict adherence to current copyright laws essentially requires that individuals who are interested in using an MP3 must be familiar with copyright violations and be attentive to the terms of use/services provided by the website or downloaded program. Otherwise, users are required to proactively seek the copyright holder for permission before downloading and/or uploading.

The challenges in distinguishing legal from illegal activities due to the rising dependency on digital technology, along with the lack of a centralized location where copyright holders of specific recordings can be looked up, fundamentally conflicts with subscribed laws.  Although many aspects of the current arrangement are still yet amiss in delivering a unified message to the public, most recent developments have included Internet service providers sending out warning letters to consumers suspected of illegally downloading copyrighted material, referred to as the Six Strikes Plan (Fitzpatrick, 2012).   The six levels of warning alerts are designed to caution suspected illegal downloaders in a progressive fashion.  Initial alerts range from innocuous emails and suggestions for legal avenues in obtaining copyrighted material whereas higher levels consist of stern warnings involving mandatory copyright tutorials or severe reductions in Internet speed for a specified time.  The punitive measures linked to the last level of warnings are up to the discretion of Internet service providers.  Other activities directed toward illegal music downloading include educational campaigns directed toward students and parents (IFPI, 2009) in addition to increased surveillance of sharing sites and student Internet activity on university networks.

## Changes in Technology

Although changes in technology and copyright laws are interwoven, the manner in which different technologies were treated and viewed under copyright law over the years serves as an indicator to its future direction. Beginning with the printing press, one of the primary goals of early copyright laws was to alert printers of protected intellectual creations. Once the ideas and work were officially registered by law, the burden was on the printing companies to avoid illegal infringement by making certain that presented manuscripts were not previously registered by another holder. Verifying the content ownership of works was difficult due to the spreading out of registries over long distances throughout the country. Under these conditions, ownership by another party was officially assumed by the mere marking of a special insignia on the printed work.

However, sound recordings presented even more complex challenges. Mechanical pianos, for instance, provoked debates surrounding the distribution of owed profits to the composer, publisher, and manufacturers of piano rolls. Determining precisely which rights were violated under existing copyright laws when musical pieces were recorded into piano rolls fell under scrutiny. This was due to protections provided only for musical compositions, not sound recordings, during that period of time. In response, the 1909 Copyright Act allowed subsequent recordings, in exchange for a flat rate of a few cents, for each manufactured copy paid to the composers or right holders. These rulings were the first to establish the distinction between compositions and their recordings (Lemley & Reese, 2004).

But the invention that served as the major turning point in the history of sound recordings was the phonograph invented by Thomas Edison in the late 1870s. This new invention was originally envisioned to record speeches and sounds onto a wax cylinder, which were not copyrighted material. Eventually, its introduction led to future generations of devices that were classified under court as “dual use technologies”, because of their ability to play back sound and record. The cassette tape and compact disk recorders are among the successors (Lemley & Reese, 2004).

The steady advancement of these dual use technologies ignited further discussion regarding the provision of copyright protection to the sound recording itself, particularly as a consequence to the widespread use of cassette tape recorders, which marked the initial peak of music copyright infringement (Cummings, 2010). Measures to replace the flat royalty solution that was adopted in the Copyright Act of 1909 in response to issues formerly presented by the mechanical piano, were demanded by recording companies. They argued that the substantial resources (e.g., money and time) invested toward creating recordings and guiding careers of budding artists justified more control over their own products. Ultimately, a bill providing a federal copyright for sound recordings prevailed over other propositions in 1971. This major move allowed music to be the only form of intellectual property that consists of two copyrights: one for the composition itself and one for the recording.

The digital age has clearly facilitated an unprecedented volume of copyright violations through the invention of the Internet. The rise of the Internet, has heightened the illegal sharing of music via P2P sites in the form of MP3s (Popham, 2011). An MP3 is a compressed digital file with compressed audio tracks called MPE (MPEG-Audio Layer 3). Specialized computer software assists in copying music tracks from compact disks onto computer hard drives as MP3s. Unlike its music recording predecessors, music tracks in the form of MP3s allow the sharing, transmission, and recording of music with much less effort and faster speed. Furthermore, as personal computers became more prevalent, the storing of music in hard drives only required very little space with quality being practically equal to compact discs and much better than that of cassette tapes. Of note, the exorbitant penalties and fines that are currently in effect under law were shaped during an era when serious music and video piracy required time and equipment to produce the same quality product that was offered in retail stores. On the other hand, the MP3 allowed good quality music to be easily accessed from P2P sites through potentially illegal means. The launch of the first P2P music sharing site, Napster, in the 1990's caused tremendous upheaval to the music industry.

Beginning with Napster, the rapid growth of illegal downloading activity has stunned corporations involved in the creative industries. Law makers and the music industry are continuously confounded by the tenacious activity of crafty computer programmers who developed new and improved P2P sharing sites. Many of these innovative efforts have proven to effectively dodge the legal system by evading detection or implementing features that circumvent legal accountability. The original form of Napster used centralized servers that connected the music libraries of approximately 70 million users (Chiang & Assane, 2002). After the courts rendered them guilty for infringement, subsequent systems were modified to allow users to share music through direct connections as opposed to a centralized server.

However, limitations set by ambiguous and dated copyright laws along with rising dissenting attitudes held by leading music consumers have left record labels fluctuating between taking legal action against owners of infringing sites (e.g., Napster) and random individual perpetrators from a pool of millions. By trial and error, the recording companies, represented by the RIAA, have ultimately realized that pursuing litigation against or receiving cooperation from secondary and possibly tertiary infringers was more economically feasible than going after the millions of individual uploaders and downloaders in P2P sites.

The different issues raised over the years demonstrated that the United States courts were consistently confronted by disputes regarding the most appropriate applications of copyright laws given the technological capabilities and the economic climate of that point in time. For instance, the recording industry's victory in acquiring copyright protection for sound recordings can be arguably attributed to the economic recession that was occurring in the late 1960's and early 1970's (Cummings, 2010). Moreover, it is important to note the slight nuances within the interpretation of the law by the court system. For example, defendants have claimed that P2P sites share similarities with legal recording devices such as the Betamax, which played and recorded media. However, the courts considered the two technologies remarkably different. The courts determined the Betamax innocent of infringement, because it could not control the behavior of consumers, particularly if they were using it as a means for 'time shifting', which allowed them to view the public material without breaking the law. Although P2P site attorneys initially argued for the dual purpose excuse, it did not hold in court, thereby becoming a controversial ruling according to some advocates. Exact designations of where in the process the digital copy was stored and copied complicated the controversy, because it provided loopholes for later P2P sites that established decentralized servers.

**Summary**

According to the pattern of events, it is evident that the courts showed no indication that the laws will be steered toward lessened protection for online music. Furthermore, the economic recession that occurred during the record industry's win for protected sound recordings can be seen as similar to the economic climate occurring now (Cummings, 2010). This provides stronger evidence that strengthened regulation may soon be adopted as technology advances.

This paper asserts that the historical and recent pattern of events indicate that the enforcement of existent copyright laws and penalties will become stricter in time.

## Why People Engage In Music Piracy

As mentioned previously, a succession of appeals over the course of many years recently resulted in court rulings that found two P2P sharing defendants liable for exorbitant fines owed to the copyright holder plaintiffs. The verdicts served as a clear warning to users of P2P sites that they are culpable under law. Despite the severity of the rulings of these participants, however, experts do not foresee this behavior to cease all together soon. According to a study by the International Federation of Phonographic Industries, over 40 billion music files were downloaded illegally in 2008 despite state, federal, and international laws prohibiting such action (IFPI, 2009). P2P sharing has gone up significantly from 5.5 million users a month in 2003 to over 9.3 million in 2006, regardless of the 20,000 lawsuits initiated by the RIAA (Knopper, 2007; Lyonski & Durvasul, 2008). Nevertheless, as the years progressed and digitized music benefitted from improved performance, portability, and hence consumer satisfaction, reports have noted a significant drop in music file sharing in 2012 (NPD Group, 2012). For instance, there was a 44% drop in songs burned and ripped from CDs between 2011 and 2012. The number of music files shared from hard drives decreased by 25% and the amount of songs downloaded from digital lockers dropped by 28%, based on NPD reports (NPD group, Music File sharing declined significantly in 2012). Furthermore, the International Federation of Phonographic Industries have found that 20% of Internet users worldwide regularly access unlicensed services (IFPI, 2017). However, this estimate only includes piracy conducted through desktop platforms and does not factor in music piracy that occurs with portable devices, such a smartphones and tablets. As such, technologically savvy website developers continue to derail the legal system by evading detection or implementing features to circumvent legal repercussions. Furthermore, as long as there is a means in acquiring music for free, patrons who are oblivious, unconcerned, or critical of these laws will continue to follow these sites.

Although music piracy is a relatively new phenomenon compared to other forms of illicit behavior, the body of research is steadily growing. The investigation into music piracy has been studied through multiple approaches. For example, some studies examined the similarities and differences with other types of piracy, such as software piracy, with the aim of comparing and contrasting plausible business models, deterrent mechanisms, or educational strategies (e.g. Chiang & Assane, 2002). Others have focused on the socioeconomic factors that lead to differences in the level of piracy activity between countries (e.g., Proserpio et al., 2005). Likewise, several studies have opted to focus on connections to demographics and stable personality traits such as general ethical disposition and self-control. Behavioral models, which are common in social psychology, provide an in depth examination of the antecedents to normal behavior. These models have been extended to better understand more specific attitudes and beliefs associated with ethical guidelines and principles. Through these behavioral models, we may gain insight into the rationale of music piracy.

Behavioral models integrate different factors that may contribute to music piracy, the target behavior. The fundamental factors that are commonly applied comprise the Theory of Reasoned Action: attitudes, intentions, and behaviors (e.g., Kwong et al., 2003). Attitudes refer to the positive or negative evaluations of music piracy behavior, which may be influenced by other psychological determinants, such as beliefs or feelings (e.g., Ajzen, 1991, 2002; Morton & Koufteros, 2008). Intention represents the effort willing to be exerted toward music piracy, which is driven by attitudes. Based on the model, attitudes directly impact the intentions to engage in the target behavior.  The Theory of Planned Behavior added social norms and perceived behavioral control as antecedents of intentions to the Theory of Reasoned Action. Although much of the research attends to the illegal downloading or uploading of music from P2P sites, there are few research studies that have focused on the purchase of tangible pirated music products.

Overall, several variables related to piracy have been uncovered by behavioral research. In accordance to behavioral theories, the factors that have been heavily associated with this illicit behavior are social norms, self-control, attitudes, and demographic/ personality variables.

**Behavioral Control and Subjective Norms**

Studies have revealed that past piracy behavior is a strong predictor of future behavior. This finding indicates a strong habitual component (e.g., Lyonski & Durvasul, 2008; Morton & Koufteros, 2008) and underscores the significance of self-control on music piracy behavior (e.g., LaRose & Kim, 2007).  In fact, behavioral theorists maintain that self-control, a self-assessment on the ability to regulate ones' actions, is an influential factor across different forms of behaviors (Ajzen, 2002).  When examining the influences of self-control, biological sex, Internet experience, affiliation with deviant peers, and grade level on attitudes toward piracy, the strongest predictor was self-control followed by grade level (Malin & Flowers, 2009). Older students, who reported less self-control, viewed music piracy positively.  Under the widely accepted notion that attitudes impact behavior, it was concluded that older students were more inclined to engage in music piracy than others.  Low self-control might be more frequently found among undergraduate students than among children or adults due to their propensity for sensation seeking activities when separated from parental supervision for the first time (Hinduja, 2012).  Consistent with these results, data revealed that being 20 years of age or older reduced the likelihood of piracy behavior and those with lower levels of behavioral self-control were more likely to illegally download MP3 files than those within higher levels of behavioral self-control (Lysonski, 2009).

Self-control, one of the fundamental components of the Theory of Planned Behavior, has been identified in the General Theory of Crime as a main causal factor in all crimes (e.g., Gottfredson & Hirschi, 1990; Hinduja, 2012). Within the criminology field, self-control can be characterized as having six dimensions, including risk seeking, temper, simplicity of task, physical activity of task, self-centeredness, and impulsivity. The theory posits that normal amounts of self-control, as a personality trait, can be achieved through effective parenting and monitoring practices. However, out of all the six dimensions, risk seeking was the only dimension that was found to be a significant and positive predictor of digital piracy behavior (LaRose et al., 2006).

As another principle component of the Theory of Planned Behavior, social norms reflect the viewpoints of close associates regarding the target behavior, particularly those of family and friends (Wingrove et al., 2011). Subjective norms reflecting the perceptions of parents and the university's approval of music piracy, was found to have a nonsignificant correlation with downloading intentions or downloading control (LaRose & Kim, 2007). Nevertheless, research has also supported the utility of educating parents and teachers on the consequences, because the lack of condemnation of the act by surrounding social networks appears to be overriding the impact of attitudes on behavioral intentions (Morton & Koufterous, 2008). This was supported by findings indicating that perceived social approval predicted intentions to pirate, but not perceived frequency of other's downloading (Wang & McClung, 2010). Intentions to illegally download music in the future were strongly influenced by peer norms, particularly if there was little punishment (Levin et al., 2007), because the sharing of common musical preferences cultivates social relationships. In this respect, positive emotions stemming from this connected community assist in reinforcing the behavior. This is sustained by a sense of strong obligation to return kind actions through the principle of reciprocity when exchanging free music (Gopal et al., 2004). Furthermore, conceiving the exchange as a form of gift giving may contribute to the perception that the behavior is purely benevolent in nature (Giesler, 2006; Giesler & Pohlmann, 2003). Findings support the results of Woolley and Einning (2006) which indicated that attitude and subjective norms were significant predictors of piracy. Although there was no research linking copyright knowledge to music piracy, the weak relationship found between copyright law knowledge and software behavior (Nandedkhar & Midha, 2011) may perhaps be extrapolated to music piracy, due to the strong influence of social approval.

Self-control and social norms are only some of the factors that lead to the engagement of behavior. Underlying attitudes, distinctive personality variables or characteristics, and situational factors have also been found to contribute to the intertwined and complex nature of the behavior.

**Attitudes and Beliefs**

Attitudes are the negative or positive evaluations that may drive an individual to engage in the target behavior (Ajzen, 1991). Described as a "readiness of the psyche to act or react in a certain way", attitude is one of the most important factors to influence music piracy intentions (Jung, 1971). For example, attitude toward piracy is a strong predictor of intention to buy pirated CDs (Kwong et al., 2003). It has also been found to be an important determinant of behavioral intention for exchanging music in P2P sites (d'Astous et al., 2005; Kwong & Lee, 2002; Nandedkhar & Midha, 2011). Attitudes, behavioral intentions, and behaviors are rooted in belief systems.

Belief systems motivate a negative or positive perception (attitude) of the behavior and significantly affect the intention or engagement of behaviors (e.g., Lyonski & Durvasul, 2008). Ethical theories along with theories borrowed from criminology literature (i.e., General Theory of Crime and Deterrence Theory) and the consumer deviance field have attempted to extend the behavioral theories to account for a variety or belief systems.

Scholarly literature centering on ethics focuses on determining if a behavior is consistent with upheld values and principles. Ethical beliefs have been defined and proposed in music piracy investigations at varying levels. In the broadest sense, ethics can be viewed as an individual trait or disposition (e.g., Gopal et al., 2004). Some studies concluded that non-downloaders have a greater generalized ethical concern than downloaders (e.g., Levin et al., 2004; Robertson et al., 2012). For example, people who scored low in general ethical orientation engaged in illegal downloading activities and stole more than those with high ethical orientation (e.g., Lyonski & Durvasul, 2008). Similarly, intentions to pirate are predicted by moral obligation or guilt from engaging in the act (Al-Rafee & Cronan, 2006). These results suggested that those who felt guilty or had a moral obligation to perform correct behavior, felt inhibited from engaging in piracy activities (e.g., Wang & McClung, 2010). A congruent relationship between online and offline misbehaviors may exist, in which online misbehavior reinforces existing misbehavior (Selwyn, 2008). Thus, it is conceivable that the Internet may allow deviant individuals to extend their misbehavior from offline to online activities.

Yet, a survey conducted by the Pew Internet Project in 2005 revealed that only 10% of respondents reported that they discontinued downloading, because they considered it wrong. To further understand the ethical decision making process, researchers have subdivided the measurement of the ethics construct into moral principles and consequences (Robertson et al., 2012; Thong & Yap, 1998). Moral principles refer to the perceived rightness of behavior independent of rules that regulate them (e.g., Jambon & Smetana, 2012). The impact of consequences, however, is assessed through a variety of considerations. These include the valuation of probability, the perceived importance of negative repercussions that may be experienced by oneself or other parties (e.g., recording industry, artist and society), and the level of desirability. Intentions to pirate were more influenced by consequences rather than by moral principles (Thong & Yap, 1998). Therefore, the strong influence of the perception of punishment on this type of behavior may explain why only a small percentage of downloaders withdrew from the illegal activity due to morality. In other words, indifference towards the illegality of music piracy may result from the assessment that the behavior will go unpunished, which may conceivably encourage the perception that the behavior is socially approved.

In a Taiwanese sample, perceived prosecution risk and magnitude of consequences were among the few variables that significantly influenced consumer's attitude and behavioral intention toward the illegal sharing of MP3s and purchasing of pirated music products (Chiou et al., 2005). After manipulating the severity of punishment, students in high severity conditions expressed significantly lower intentions to download music in the future (Levin et al., 2007). In this study, deleting computerized music files served as a weak severity, doing community work as moderate severity, and paying a fine of $2,500 per song served as a high severity consequence. With only a slight threat of punishment, peer norms served as a predominating influence over music piracy behavior; thus, providing further support on the power of peer impact. Likewise, in a software piracy study, increasing consequences for digital piracy were found to decrease intention (Glass & Wood, 1996). Perceptions of punishment certainty and severity, with adequate levels of threat, were significantly associated with attitudes toward software and music piracy (Peace et al., 2003; Sinha & Mandel, 2008).

Although some studies found that perception of consequences and threat may generally deter downloading behaviors, others have found limiting effects. For example, in examining the roles of ethical constructs, deterrent strategies, and demographic variables, Gopal et al. (2004) concluded that deterrence is not significantly related to a decrease in downloading behavior. The method was unique from previous studies as subjects completed a questionnaire following the presentation of a true news story containing information regarding legal consequences. They proposed that the lack of influence of deterrent strategies (e.g., enforcement of laws and punishment) may have a weak relationship with the behavioral intention to pirate, because the conception that music should be free is deeply embedded into the cultural norms of the respondents. Therefore, they concluded that the focus should be toward an appeal for altruism and support while simultaneously implementing preventative methods through the use of hardware and software systems rather than on legal issues such as jail sentences and fines. They maintained that the intervention needs to be sustained over a long period of time, before it is effective. In contrast, data from another study supported the impact of fear of consequences on illegal downloading intentions, but weaker relationships existed with appeal to ethics or guilt, leading to the conclusion that punishment may only have a short term effect (Lyonski & Durvasul, 2008). Still, others have argued that it may be very difficult for subjects to imagine the severity of the behavior and the potential legal ramifications, because legal enforcement is not yet consistent (Sinha & Mendel, 2008).

In addition to severity of consequences, the impact arising from the probability of consequences has been under question. After evaluating the impact of various anti-piracy arguments, researchers concluded that there were no significant correlations between consequences (i.e., fines and legal prosecution) and intention (d'Astous et al., 2005). Rather, intention to swap music online depended on one's attitude toward music piracy, the perception that important others encourage this behavior (social norms), and perceived competency in performing it. Although perceived consequences were found to be non-significant with piracy intention, the importance of perceived competency uncovered the potential influence of the probability of getting detected and penalized. Due to these findings, the probability of getting caught may be more effective in deterring music piracy and increase perception of risk over the severity of consequences (d'Astous et al., 2005). This was later supported by Zhang, Smith, and McDowell (2009) who found that self-efficacy served as a mediator between perceived punishment certainty and digital piracy behavior. This revealed that low certainty of getting caught influenced self-efficacy in a manner that promotes piracy. Nonetheless, conflicting findings regarding the impact of certainty and severity of punishment exist in the literature. For example, although perceived punishment severity and certainty were not significantly associated with attitude toward online music piracy, Morton and Koufteros (2008) found that the relationship was stronger for severity than for certainty. These findings were in alignment with software piracy research, in which punishment severity was a stronger predictor of attitude than punishment certainty (Peace et al., 2003).

Together, the impact of probability of punishment versus the severity of punishment on the attitudes or intentions of the behavior remains unclear. These inconsistent findings signify the need for more research in this relatively new phenomenon, particularly because the technological and legal climates are still evolving. Nevertheless, there is widespread agreement that the control of the illicit behavior requires that enforcement actions are publicized through campaigns or through actual threats to assist in preventing the perceptions associated with ease and low risk of being apprehended (e.g., Cheng, Sims, & Teegen, 1997; Chiang & Assane, 2008). A more radical approach, proposed by Sag (2006), consisted of taking legal action on all those engaging in the behavior regardless of the magnitude of piracy. Through these measures, the moral and legal acceptability of file sharing can subsequently shift by means of conveying to the public, particularly less committed file sharers, that breaking the law is not inconsequential. By targeting less committed file sharers, the activity of more technologically savvy and dedicated file sharers should substantially decrease (Sag, 2006).

**Additional Negative Consequences**

In addition to legal consequences, other types of negative repercussions have been examined with regards to impact on music piracy. According to the ethical model of behavior, the importance and severity of negative outcomes that may be experienced by oneself and other parties, such as the recording industry, artist and society, is evaluated when forming an opinion about the activity (Hunt & Vitell, 1986). The next section will review the types of negative repercussions that may be considered influential in whether to engage in the behavior.

**Consequences to the engager.** Consequences have been approached using theories borrowed from the criminology literature, such as General Deterrence Theory (Lee & Lee, 2002; Morton & Koufteros, 2008). In accordance with General Deterrence Theory, those who engage in music piracy are viewed as rational actors who deliberate over the advantages and disadvantages of the potential outcome. In this respect, impressions of the involved dangers or “risk perceptions” can develop, which play important roles in shaping individuals’ attitudes toward piracy (Chiou et al., 2005; Nandedkhar & Midha, 2011). The research thus far has predominantly examined the effects of consequences and risks in terms of legality.

However, there has been very limited research concerning other risks and consequences, which may be less obvious, such as those presented by embedded viruses, copyright trolls, and the social costs associated with getting detected and reprimanded by authorities. Tan (2002) identified several risks linked to software piracy. These include performance, financial, social, and prosecution. Performance risk refers to computer malfunction caused by viruses. The pirated software may impose financial risk, which is reflected in terms of time lost and expenses related to recovery and replacement. When social image is sought to be preserved, the risk of being detected or being reprimanded by authorities is a representation of a social threat. Tan (2002) included prosecution risk as a replacement of physical risk in the original model, which is related to the risk of legal accountability and punishment. His results revealed that manipulating each of the above risks significantly decreased consumers’ intention to purchase pirated software.

Some of these risks have been mentioned under the context of music piracy. For instance, performance risk is a likely source of deterrence by P2P users due to increased vulnerability to viruses and invasions of privacy. The degree of exposure to computer viruses is much higher on P2P networks than other conventional Internet sites (Sag, 2006). In addition, malware does not have to appear in audio files, because spyware can be installed along with the actual P2P program itself. This dramatically increases the risk of exposing their Internet

Provider (IP) address and entire system to other hackers (Sag, 2006). In terms of social consequences, the effect of embarrassment was minimal based on the statistical probabilities of getting caught (Sinha & Mandel, 2008). Impacts of other risks such as performance, financial, and social have not been examined extensively compared to prosecution risk in the existing literature and warrants further attention.

**Effects to stakeholders.** Studies have found that the illegal downloading of music is largely considered less serious than other forms of illicit activity over the Internet (Ang et al., 2001). There is widespread agreement that downloading music is not as serious as stealing a CD from a music store, because the behavior is perceived as a victimless crime with little risk of getting caught (Wingrove et al., 2011). This attitude was particularly found among those of Generation Y, who believed that the behavior was not causing harm and that they were victims of inflated music prices kept artificially high by the music industry (Freestone & Mitchell, 2004). These attitudes, however, are understandable given that they have been dependent on the World Wide Web for the greater part of their lives.

Furthermore, as opposed to other forms of illicit behavior concerning tangible goods, music piracy has not been provided the time to be regulated through the underlying forces of society (Beckerman, 2009). Through the use of punishments across time and cultures, stealing tangible goods, for instance, is universally deemed as an immoral act. As a result of the evolving nature of the legal and technological climate, the moral codes that are currently upheld by most for the physical world are clearly distinct from the virtual world (Selwyn, 2008).

Attitudes directed toward the recording industry and artists have also been examined under a construct termed “legitimacy of authority” (Wingrove et al., 2011). Since the initiation of the legal prosecution of individual infringers and later of illegal Internet sites, attitudes regarding RIAA and artists on music piracy have received much attention. This is due to the diversity of advocates on both ends of the heated dispute surrounding copyright and World Wide Web regulation. The discontent toward stricter measures has not been limited to constituents of the Internet service industry, who are concerned about jeopardizing consumer trust and loyalty at the expense of adhering to "draconian" government policies (Chiang & Assane, 2002; Garon, 2003). The unfavorable views are reinforced by the belief that the motives and intents of the record industry are unjust and unrealistic, which are expressed by experts, academics, and the general public (e.g., Yar, 2008). Hence, those who challenge austere measures urge the record industry to embrace the new technologies and convey to their consumers that they care about their welfare, instead of attempting to impose guilt (Shang et al., 2008). Moreover, there have been studies that examined downloading behavior in terms of sales displacement, in which downloading reduced purchases by approximately 10% (Rafael & Waldfogel, 2006). Therefore, the very low displacement rates (one downloaded album displaces less than one purchased album) indicated that at least some of the downloaded music would not have otherwise been purchased. This suggests that downloaded albums are low valued and that the harm done by downloading is limited. Under this perspective, some argued that music would assist in drawing an audience for unfamiliar music, referred to as positive network externality (Bhattacharjee et al., 2003). The Pew Internet Project found that less than 20% of respondents believed that individuals should be held accountable under law ("One in Five Downloaders," 2005). Unsurprisingly, the percentage figure was even lower for young adult respondents.

Nonetheless, empirical findings revealed that there was little influence of attitudes concerning the RIAA's position on music piracy. Respect for the music industry had the weakest relationship to legal compliance relative to other variables such as punishment, social influence, and moral obligation (Wingrove et al., 2011). Cynicism, which is defined as mistrust toward the motives of others, was found to be weakly associated with piracy (Woolley, 2010). Similarly, anti-big business sentiment was not associated with intention of downloading or past downloading behavior (Lyonski & Durvasul, 2008). Furthermore, downloading intentions were also not highly associated with views regarding the morality of not paying recording artists their rightful profits. Rather, it was found that some may download due to the belief that music piracy benefits consumers, musicians, and record industries (Coyle et al., 2009). Interestingly, there have been findings revealing a significant positive correlation between anti-big business sentiment and attitudes toward intentions to buy pirated CDs among a sample of Chinese consumers (Kwong et al., 2003). Nevertheless, with the exception of a few cited studies (e.g., Condry, 2004; Huang, 2003), research results overall have failed to support the effects of anti-big business sentiment or cynicism as major influences on piracy behavior, particularly downloading behavior.

**Incentives**

From a criminological perspective, perpetrators of a crime assess the perceived value of committing a crime and overlook the associated drawbacks (Dhami & Mandel, 2012). Respondents reported that the most popular positive incentives of music piracy are faster downloading speed, availability of rare recordings, high digital quality, free samples, and easy compilations (Sinha & Mandel, 2008). Furthermore, there is a widely common sentiment that consumers would prefer to pay for the one song that they desire, as opposed to a whole album. In addition to measuring piracy intent directly, Sinha and Mandel (2008) measured willingness to pay in order to circumvent confounds linked to social desirability responding. They found that the willingness to pay increased as website functionality and ease of use increased, highlighting the influence of positive incentives in deterring behavior. Therefore, to protect property rights, some have advised the record companies to acknowledge the consumer benefits brought via new digital and network technology, instead of simply declaring their intellectual property (Shang et al., 2008). For example, the slow growth in music sales was attributed to the introduction of the digital rights management (DRM) initiative, which employed encryption technology to limit the reproduction and distribution of music that was legally purchased (Sinha et al., 2010). Other than limiting the number of digital copies made, DRM posed restrictions on the number or types of devices that consumers may use to store or listen to their music. This led to the conclusion that a DRM-free environment would assist in deterring consumers from pirating and encouraging consumers to legitimately purchased music (Sinha et al., 2010). Other types of positive incentive schemes cited by Sinha et al., (2010) in reinforcing legitimate music have been recommended in literature, such as differentiating the product/service to create different versions for market segments, using bundling strategies, offering downloadable live concert recordings, and providing superior service, user friendly features, or customized recommendations.

Many have asserted that the exorbitant prices of music triggered the popularity of music piracy (Kwong & Lee, 2002). In addition to perceived benefits, perceptions with regards to monetary cost have been under close examination. These studies aimed to identify whether price was a motivator of this behavior and secondly, ascertained the amount of money consumers are willing to pay for this new type of commodity. Many researchers believed that a rise in price may attract more consumers toward pirated music due to the rise in benefits in obtaining the pirated material (Bhattacharjee et al., 2003; Gopal et al., 2004; Sag, 2006). This is consistent with the finding that respondents who believed that illegal downloading would help save money were more likely to engage in the crime (Wang & McClung, 2010). Likewise, increasing the price of a music CD has a significant positive effect on the piracy of that CD (Bhattacharjee et al., 2003). In comparison with unknown songs, the willingness to pay is higher for known songs (Gopal et al., 2004). Although the risk of getting caught had a significant, positive impact on willingness to pay, it was found that a 10% increase in getting caught amounted to an increase in $.03 of willingness to pay (Sinha & Mandel, 2008). In the same study, the willingness to pay was high for all positive features, with the most popular being fast downloading speed, availability of rare recordings, high digital quality, free samples, and easy compilations. In a pretest that randomly exposed subjects to one of five bids between $0 to $1.50, 64% of respondents stated that $1.00 was acceptable whereas 42% stated that they were unwilling to pay $1.50. Nevertheless, the assumption that consumers who perceived negative treatment in terms of costs by the record companies would increase their likelihood in pirating music, was not supported (Coyle, 2009). This finding illustrates that the perceived economic advantages of acquiring music illegally have a clearly distinct and potentially stronger influence on piracy than resentment toward the music industry.

**Situational Variables**

The legal and social climates are gradually transforming due to efforts to keep up with the rapid advancements of the technological age. Challenges associated with the growing scales of operations, the integration of operations, and those faced due to aggressive competition and deregulation must be overcome by companies (Rasmussen, 2002). The rapid changes further complicate the activities of the consumer, because music piracy is quickly changing from a non-regulated and normative behavior to a deviant behavior when viewed under the matrix of deviant consumer behavior. In this view, placing more emphasis on reforming situational factors over beliefs and attitudes is justifiable (Moschis & Cox, 1989). For example, inadequate socialization, socialization to deviant norms, inappropriate or inadequate communication of norms, and emotional or rational rejection of norms may lead to consumer deviance. Socialization to deviant norms does not just focus on peer norms, but norms that are due to societal factors such as technological access, availability of downloadable applications used for pirating, and low certainty of punishment due to lack of legal enforcement. The inappropriate or inadequate communication of norms includes, for instance, the availability of technology with no message indicating that piracy is an illegal misuse of equipment.

Dismissive attitudes may additionally be driven by dynamics that are intrinsic to computer mediated behavior. A sense of anonymity, which may occur during computer mediated transactions and communications, may lead to the perception that music piracy is not serious (Selwyn, 2008). The sense of detachment from reality can occur in a virtual platform where the screen serves as an interface, augmenting the perception of anonymity. Anonymity may also lead to deindividuation, or a sense of lessened responsibility, in computer mediated communications, thereby reducing the impact of healthy social norms and stimulating anti-normative behavior (William et al., 2010). Furthermore, the goal directed mindset associated with Internet usage or surfing may play an important factor when reflecting on music piracy attitudes. Being narrowly focused on practical and recreational Internet activities that are now easy, quick, and convenient to perform can arguably contribute to unconcerned attitudes toward this type of misbehavior. For example, one research respondent stated that “going out to shop is expensive, inconvenient, slow, and more difficult” (Selwyn, 2008). Aside from these situational variables, certain demographic and personality factors were found to be strongly linked with piracy behavior.

**Demographic Variables**

Although both sexes respond to risk perceptions to some degree (either by actual enforcement actions and/or publicized threats), there is evidence to suggest sex differences exist in music piracy attitudes or behaviors (Morton & Koufteros, 2008; Sag, 2006). For example, attitudes toward music piracy are strongly related to perceived punishment severity for female but not male respondents (Morton & Koufteros, 2008). In general, females show a higher willingness to pay because they perceive higher levels of risk (Chiang & Assane, 2008). Moreover, females in the computer and scientific fields engaged in less file sharing than did males in the same fields (Chiang & Assane, 2008).

Evidence suggests that those who pirate are young, male (e.g., Bhattacharjee et al, 2003; Hinduja, 2012), have access to broadband width (Popham, 2011), and have advanced computer abilities (Selwyn, 2008). However, some of these demographics, such as age, have produced mixed results. In some studies, the relationship between age and intention to share music on the Internet was negative and marginally significant (d'Astous et al., 2005). A global study examining Internet piracy rates between 1999 and 2002 revealed that those aged 15 to 29 years had a significant positive correlation with average music piracy rates (Proserpio et al., 2005). Yet, although the proportion of infringers were still predominated by those ages 16 to 34 at 56%, there was surprisingly a substantial proportion of individuals aged 55 years older who reported that they have engaged in the behavior at 15% (Popham, 2011). Interestingly, a most recent study by the IFPI revealed that in 2014 the research shows 61% of Internet users aged 16-64 engaged in some legitimate digital music activity in the past six months. Among younger consumers (16-24) this figure is higher at 77%. This study also revealed that approximately 60% of people with access to the Internet from four or more Internet devices reported the illegal downloading of music as opposed to 29% who reported only having one device. In addition, Internet experience was a strong positive predictor of music downloading with computer abilities. Collectively, it can be concluded that the effect of one's age and engagement into music piracy is decreasing as technological skills and more importantly, Internet experience, are becoming augmented across all age groups. Studies have predicted the eventual closing of the age (Crockett, 1999) and gender gaps (Odell et al., 2000). With regards to technological access, technological capacity and ownership appear to be gradually diminishing as evidenced by the observation that MP3 ownership had no impact on willingness to pay (Sinha & Mandel, 2008).

Factors concerning economic status have generally produced mixed results across Internet piracy studies. The unsteady link between disposable income and music piracy was due to the practice of illegally downloading to preview music before purchase (sampling), which is most applicable to very short forms of media such as music (Bhattarcharjee et al., 2003). Data revealed that infringers with low average levels of income used illegal sites more often to sample unfamiliar music without purchasing, compared to users with greater disposable income. With regards to piracy of familiar music, however, there were no statistically significant differences between those with lower and higher levels of income. In other words, earnings did not influence pirating favorite or familiar songs (Gopal et al., 2004). Overall, piracy of music was prevalent across all music categories for both unknown and known songs. Findings that revealed no statistically significant differences in illegal downloading activity between gainfully employed individuals and students provided further support to this conclusion (Bonner & O'Higgins, 2010; Kwong & Lee, 2002). With exception to a few studies (Sinha & Mendel, 2008), music piracy seems to be prevalent across economic status.

Wide ranging levels of Internet piracy observed on a global scale has triggered the expansion of situational variables to economic and cultural explanations on a national level (e.g., Al-Rafee & Dashti, 2012; Proserpio et al., 2005). Statistics revealed that piracy levels among countries vary widely from 2% in the United Kingdom to 100% in Vietnam (Proserpio et al., 2005). Proserpio et al. (2005) isolated hypothetical and measurable indicators in a sample of countries to examine the intercultural and macroeconomic factors that explained differences in Internet piracy rates from 1999 to 2002. The types of piracy were broken down into music, movie, and software piracy. Individualism, power distance, gross domestic product per capita, average years of education, and enforcement were significantly negatively correlated with piracy. Music piracy rate was calculated by percent of counterfeit digital content in circulation. Compared to other countries, United States had a considerably lower level of Internet infringement activities relative to other countries, at 5%. Nevertheless, in view of the level of attention given to the situation as evidenced by the recent establishment of the Office of Intellectual Property Enforcement and the Intellectual Property Task Force in the United States, the protection of intellectual property will continue to be a significant national issue far into the future.

**Personality Variables**

Given that undergraduates were generally willing to pay for music on legitimate web sites to avoid breaking the law (Terrel & Douglas, 2001), focus was placed on examining other potentially influencing personality traits aside from self-control and risk seeking tendencies. Other personality traits that have been explored included optimism bias, optimal stimulation level (OSL), and Machiavellianism.

Risk or risk seeking tendencies have been isolated and linked to music piracy in a number of studies. To better understand why some people pirate in spite of increased risks, Nandedkhar and Midha (2011), tested the role of optimism bias, which is characterized by an inaccurate sense of security from potential hazards despite one's knowledge and beliefs of the associated risk factors. This dynamic has been found in car accident risk perceptions, smoking, and sex. Their studies revealed that optimism bias is a significant moderator of the relationship between perceived risks and attitude towards music piracy, despite the high risks associated with piracy. Hence, favorable attitudes for piracy may be formed due to optimism bias.

Alternatively, risk taking behavior may be explained by individual preferences of stimulation levels in one's external environment, called optimal stimulation level (OSL). High OSL decreased willingness to pay when perceived risk of getting caught increased (Sinha & Mandel, 2008). This led to the conclusion that the threat of lawsuits or arrests by the RIAA may have increased piracy among those who exhibit high OSL, while deterring those with low OSL. When behavior and attitudes were measured under the tendency to pirate as opposed to willingness to pay, it was found that high OSL individuals pirated music. High OSL slightly (but not significantly) increased their likelihood to pirate when the risk of getting caught went up. Interestingly, the same study found that individuals who played musical instruments and attended concerts regularly had a lower willingness to pay than those who did not. The researchers proposed that music aficionados may have higher OSL, and thus a higher propensity to engage in music piracy, than the rest of the population.

Another personality trait that was evaluated was Machiavellianism, which is defined as a cool detachment from others and describes someone who manipulates others to achieve personal goals (Al-Rafee & Cronan, 2006; Sinha & Mandel, 2008). Willingness to pay was lower (Sinha

& Mandel, 2008) and music piracy attitude was higher (Al-Rafee & Cronan, 2006) when scores in Machiavellianism were high. However, distrust as a component of Machiavellianism, was found to have lesser effects on music piracy than the other subconstructs, which were general negativism and duplicity (Sinha & Mandel, 2008). Weak associations between music piracy and cynicism (Woolley, 2010) were parallel with findings revealing weak associations with distrust. In the same respect, strong connections with general negativism and duplicity was congruent with relationships found with general ethical orientation (Woolley, 2010).

**Summary**

There are a multitude of variables that have been examined to explain why people engage in music piracy. In application of the Theory of Reasoned Action, this section reviewed various factors included in music piracy research: behavioral control, subjective norms, various attitudes including those related to ethical beliefs, and risk perception. Furthermore, ways in which different forms of negative consequences and incentives can impact behavior were discussed. The section concluded with the evaluation of situational, demographic, and personality variables that have been studied thus far.

Overall, the body of research reveals that self-control, social norms, and ethical orientation (e.g., moral obligation) have significant effects on music piracy behaviors and/or attitudes. In addition, increasing positive incentives by enhancing product features or services have found to decrease piracy intentions and attitudes. Although there is still ongoing debate regarding the impact of perceived severity of punishment versus perceived probability of punishment, there is widespread agreement among researchers regarding the utility of educational campaigns and increased threats in efforts to uniformly communicate the risks involved. By raising the perception of risk or punishment within natural as opposed to experimental settings, the behavior is predicted to decline.

## The Warning

### Identifying the Hazard

Under law, composers have rights relating to control and payment for reproduction of their creative work. Composers may grant or sell those rights to others, including publishers or recording companies. As defined by the International Federation of Phonographic Industry in (2009), “music piracy is the activity involving illegal reproduction (or acquisition through illegal means) of digital sound without explicit permission from the copyright holder.” Violations of these rights held by creators and content owners are by law punishable with imprisonment or fines between $750 and $150,000 per violation.

Regardless of these copyright laws, the legal climate is currently in a state of flux as policy makers and industries struggle to overcome the challenges associated with the digital era. Amid the ambiguities and debates surrounding practicality issues, there is still universal agreement that the ultimate goal is to protect intellectual property rights without comprising technological innovation. Nevertheless, illegal downloaders of digital music are generally unaware of dangers such as being vulnerable to computer viruses embedded in P2P music files and being approached by copyright trolls that proactively seek and threaten infringers with lawsuits. Concurrently, there are commonplace measures in place as more Internet service providers and universities negotiate with the recording industry on actions that can be taken to decrease music piracy. Several corporations and institutions are sending letters to suspect consumers and students regarding penalties and service suspensions. Despite approximately twelve thousand sued people and thousands of sent letters (“Music Downloading,” 2012) there are currently no standardized warning icons to alert individuals of these dangers.

It was estimated that the Record Industry Association of America, a professional organization for music label corporations, filed 47,800 individual lawsuits between 2002 and 2008 (Sag, 2006). The civil suits include those against a 71 year old man whose teenage grandchildren downloaded from a P2P site, a 12 year old honors student in public housing, an 83 year old grandmother, and a 41 year old disabled single mother. The lack of awareness of the legal ramifications has been captured in interviews. For example, the New York Post reported that the mother of Brianna LaHara, the 12 year old from New York City who was sued by the RIAA was in "total shock". The mother additionally was quoted as saying "It's not like we are doing anything illegal, this is a 12-year old girl." At the time of this reporting in 2003, Brianna was among 261 people sued for copying thousands of songs via popular Internet file-sharing software (Mongelli, 2003).

Individual infringers are at present, endangered to a number of plausible consequences. These include being denied Internet access, suspension from educational institutions, or at worst, being charged and fined for copyright infringement. Copyright infringement is viewed under federal law as no different from other forms of criminal behaviors with academic and employment consequences.

Implementing warnings would primarily be of service to innocent infringers who are unaware of these lawful violations. The protection from a hazard, according to the hierarchical pyramid, involves three steps: changing the system, guarding against the hazard, and finally, the use of warning labels (Wogalter, 2006). Although debates and negotiations are still unfolding, both past and recent events reflect motions toward the first two lines of defense: changing the system and guarding against the hazard. These have been reflected by a variety of developments including changes in the copyright laws throughout time.

**Hazard Analysis Overview**

The hazard hierarchical pyramid serves as a guideline by researchers in the risk communication field for devising effective strategies against hazards (Sanders & McCormick, 1993). The initial steps of the hazard hierarchical pyramid are to change the system to eliminate the hazard and implement procedures to guard against the hazard. After implementing attempts toward elimination and replacement with safer alternatives, the development of a warning signal serves as the last line of defense to support these initiatives. For example, prescription drugs with severe side effects can be replaced with a safer drug with comparable benefits. Other types of design features may involve eliminating characteristics or physical features of the product that cause harm without compromising the main functions. Unnecessary sharp edges, for instance, may be removed from lawn mowers to decrease risk of physical harm (Wogalter, 2006). Thus, the prevention of potential and serious hazards through a synchronized system that delivers a unified message of safe and unsafe behavior is the reasoning behind a hazard control hierarchical pyramid.

However, hazards become increasingly imperceptible and multidimensional as society becomes more modernized. During the inception of the industrial period, when America was predominantly factory-based, the need for systems against hazards escalated to protect busy, preoccupied workers from harm (Abdullah & Hubner, 2006). Progress in the pharmaceutical arena, for example, has led to an abundance of available medications. Consequently, the need for warnings to convey critical information, such as risks linked to improper usage of drugs has increased. Similarly, individuals progressively become unwittingly exposed to social, emotional, financial and legal risks associated with virtual interactions as technology becomes more advanced. The insatiable desire for speed and convenience has driven the pull toward computer-generated commercial, financial, and interpersonal exchanges, despite the severity of potential consequences. These include threats related to security of sensitive information, fraud, and provocation (e.g., cyberbullying). With respect to music piracy, copyright infringement is a dual threat: financial harm to the right holder and legal harm to the individual infringer.

**Music Piracy Hazard Control Hierarchy**

Based on studies that examined the various environmental and individual factors that may contribute to this illegal behavior, there have been a variety of measures that are currently or are in the process of development to assist in eliminating and guarding against the hazard. These include technological advancements, legal enforcement strategies, and educational campaigns.

Technological advancements. Increasing incentives have found to be effective in deterring individuals from piracy. The record industry has pursued technological advancements in order to increase incentives that have been proven by research to change attitudes, such as affordable fee-based music subscriptions and downloading services (Chiang & Assane, 2008; Nandedkhar & Midha, 2011). The new advancements and initiatives toward revolutionizing traditional business models were summarized by Knopper (2011). Since its launch in 2003, iTunes offered songs in MP3 format for download at the nominal price of approximately $1.00 per song. In turn, Spotify rivaled iTunes services by offering a vast volume and diversity of songs online for free accompanied by commercials in between singles. By attracting potential listeners, Spotify was able to market a novel subscription plan by providing different pricing plans corresponding to extra enhancements. For instance, paying a relatively small fee enabled customers to listen to music without advertisements and the need for an Internet connection. Permitting subscribers to download music into their devices directly challenged the pay per song format offered by other companies, such as iTunes. The company further allowed the sharing of music, a social element, to attract regular users of P2P networks. Although streaming services typically paid a royalty of a fraction of a penny per listen, profits have boosted for companies that control a huge catalog of songs. Furthermore, to optimize its profit generating capabilities, Spotify has recently directed its focus on initiatives comprising of branding and live concerts as new sources of revenue. Together, these unrivaled features have propelled Spotify as the leader in the popularization of music subscription services. Since Spotify's launch, premium customers have jumped to 2.5 million. Companies such as Google and Amazon have recently followed suit by expanding the accessibility of the number and variety of digital works online with the added benefit of the ability to stream them to any computer or device, as service called "the cloud".

Furthermore, efforts toward changing the system and guarding against the hazard are reflected through the continuing development of technologies to prevent copyrighted works from being illegally accessed or shared (Chaudhry et al., 2011). Chaudhry et al. (2011) described a variety of existing technologies such as digital watermarking, digital video fingerprinting, software-splitting/virtual leashing, and brand protection architecture aimed in securing different types of works vulnerable to piracy. These ranged from audio, video, and image content to non-digital products sold on the Internet. It is assured that new technologies such as these are rapidly being developed for swift implementation to help keep up with the pace at which new information is being offered globally through the World Wide Web. With these rapid advancements in technology, more consistent legal enforcement procedures are projected to follow.

Legal Enforcement. From a legal perspective, there are many initiatives that have been proposed to replace the current system (Lemley & Reese, 2004). For instance, the low prospect of being sued can be remedied by criminally prosecuting selected users of P2P sites. These measures may include obtaining extremely large monetary judgments by targeting users whose activities are most infringing, such as providers of illegal files on P2P sites. Although the illegal file trade may not stop altogether, this tactic may reduce infringement enough that they can make a return on the investment. Another proposed approach involved imposing blanket levies and taxes on legal and illegal P2P users. Alternatively, designing a quick and cheap dispute resolution system serving as both a form of deterrence and relief for P2P users may be executed. However, Lemley and Reese (2004) cautioned that procedural safeguards with clear parameters that specified how many files must be downloaded within a time period to be deemed unlawful must be established. Parameters must additionally take into account fair use issues so that users can prove uploading only out of print works, engaging in critical commentary, or space-shifting CDs that are already owned. Overall, the broad penalization of each infraction would be the ultimate goal of the cheap resolution system. Nevertheless, the authors acknowledged that none of the approaches are perfect and are likely to work better in some contexts than in others. Raising the penalties of direct infringement and lowering the expenses associated with enforcement are essentially the two basic types of alternatives that received the most mention among the proposed solutions.

Other more radical proposals include making enforcement less predictable, such as through varying target selections. Based on the rationale that consumers will always change behavior to avoid detection, adopting a mixed strategy in apprehending music pirates seems to be the best approach and is better than the status quo (Lemley & Reese, 2004; Sag, 2006). Groups such as The Electronic Frontier Foundation (EFF) offer instructions, for instance, on how not to get sued by the RIAA for file sharing. Because stringent laws do not appear to be sufficient to deter piracy, subjecting public actions against common individuals was recommended (Nandedkhar & Midha, 2011).

On the other hand, as mentioned previously, some studies found that fear of consequences does not have an impact on the propensity to download illegally, because results reveal that appeals to ethics or guilt are not likely to measurably deter illegal downloading. Gopal et al., (2004) also found limited impact of deterrence on music piracy attitudes. They argued that unlike software piracy, music may be more linked to artists rather than the producers of the music. The reduced association of piracy with the publisher may lead to "the reduced appreciation of the full legal ramifications" (Gopal et al., 2004, p.101). Although music piracy dropped significantly following the prosecution of individual pirates by the RIAA, rates have been increasing in recent years (Pew Internet Project, 2005; Wingrove et al., 2011). This suggests that current deterrent strategies may be an ineffective long term strategy for compliance. Because the use of punishment may have short term effects, other positive measures are required. This has stimulated research in the utility of educational and legal campaigns.

Education campaigns. Educational campaigns have been suggested by several researchers (e.g., Chiang & Assane, 2008; Gopal et al., 2004; Nandedkhar & Midha, 2011). Gopal et al. (2004) suggested an appeal to altruism and support rather than focusing on legal issues with potential for jail sentences and fines, because of findings that indicated a weak relationship between justice construct and music piracy attitudes. Due to the widely held perception of P2P sites as a mutually benefitting community, educating users about copyright laws in efforts to inspire attitudinal change about appropriate copying behavior was recommended (Chiou et al., 2005).

However, changing attitudes and behaviors is complex, because of inconsistent messages communicated to consumers (d'Astous et al., 2005). Although many organizations mobilize to stop music piracy, other organizations like Internet Service Providers and manufacturers of MP3 players and CD recorders try to convince consumers of the benefits of music online. As a result, these mixed messages may lead to ambivalence (d'Astous et al., 2005). Garon (2003) insisted that education must be positive in tone to instill a new public understanding that copyrighted works are not automatically public goods. In efforts to facilitate a renewed connection between the Internet and long established copyright culture, the public needs to be reminded of the distinction between ideas and expression. At the same time, voluntary sharing of copyrighted works must be encouraged without violating the rights of others who do not permit their works to be reproduced or misused without permission.

Furthermore, educational and marketing campaigns extending to populations outside of youth and college campaigns are essential for progress (Popham, 2011). In 2010, participants aged 16 to 34 were six times more likely to download music than the elderly reference group. These respondents would have been 5 and 23 years old when Napster, distributed in June 1999, made large scale file sharing available to the public. Whereas the oldest members of this group would have been university aged, the youngest would have enjoyed a decade of high speed Internet technologies and widespread file sharing. In recognition of this need, the IFPI have partnered with other agencies in developing and executing educational campaigns internationally. According to the IFPI (2009) report, special focus was directed toward the education of teachers and parents who may be challenged in informing students regarding the dangers of the Internet, with which they themselves may be unfamiliar. Several educational campaigns cited in the report included publications, documentaries, customized curriculum materials, and student competitions for best anti-piracy campaigns. In addition to a diverse array of educational campaigns, legal enforcement initiatives may support the facilitation of behavioral and attitudinal shifts in this demographic.

**Purpose of the Warning**

As the last line of defense against hazards, warnings have a universal presence across all areas of industry for communicating essential information to specific receivers. The overall purpose of warnings is to support environmental and product safety by serving as a provider of information with regards to the hazard, the potential consequences, and safe and unsafe behavior (Laughery & Wogalter, 2011). Communication of this information is required when hazards are unknown or unrecognized from product users, are likely to be encountered during product use, and entail serious injury to the user (Lenorovitz et al., 2012). Warnings can take on many forms, such as placards, posters, decals, and tags. However, due to new technology, new forms and untraditional types of risk communications are in development. These include video warnings, flat panel displays, and auditory warnings that incorporate digitized voices (Wogalter & Mayhorn, 2005).

Common goals of warnings include the reduction of uncertainty with respect to how to use a product safely (DeTurck, 2002) and the facilitation of informed decisions about compliance (Wogalter, 2006). Information can be conveyed through prescriptive, proscriptive, or descriptive designs. Whereas, prescriptive warnings depict behavior to be performed to avoid a particular hazard (e.g., wear goggles), proscriptive warnings depict the prohibited behavior (e.g., standing on rails). The communication of the existence of a hazard is achieved through descriptive warnings (Ng & Chan, 2009). Some studies suggest that the likelihood of compliance increases when detailed procedures for acting safely are provided ("wear rubber gloves and protective glasses") than when users are informed of what not to do ("avoid contact with eyes and skin") (Rogers et al., 2000). Prohibitive warnings are not suitable particularly for hazardous activities that are unintentional or unconscious by nature (Leonard & Karnes, 2005). For instance, the unintentional protrusion of legs or arms outside the vehicle by recreational vehicle riders during turbulent motions requires the addition of safety features that will eliminate or guard against the potential dangers. When the prohibitive behavior is unintentional, in other words, a warning label showing legs outside with a slash will be insufficient relative to built-in safety locks or rails to prevent such behavior.

Provided that the actions outlined by the hazard hierarchy analysis are performed, warnings may serve as a reminder to receivers so that the proper behaviors are communicated during the most appropriate time. Hence, warnings are a supplement to a good product design (Lehto & Salvendy, 1995), but not a cure for a poor design or breakdowns in safety systems (Laughery & Wogalter, 2011).

**Warning Process**

Just as there are models that help provide a framework for behavioral dynamics (i.e., behavioral theory) and hazard control guidelines (i.e., Hazard Control Hierarchy), there are several models that assist in defining the processes entailed in making the warning effective. A commonly used model is the three stage AKC model of effective warning processing, which stresses the role of *attention*, *knowledge*, and *compliance* (Laughery & Wogalter, 2011). Across these models, it is assumed that compliance is achieved through a progression of steps. If information is not processed at a stage, then blockage of information may occur, causing the processing of a warning to be disrupted (Laughery & Wogalter, 2006). For instance, if a receiver notices and comprehends, but does not believe that a product is unsafe, then compliance will be affected. Moreover, the incorporation of belief systems, values, and decision-making judgments that motivate compliance may minimize warning effects (Wogalter, 2006). In recognition of the complex and overlapping nature of the stage-based warning models, warning features have also been regarded as components that fulfill both the alerting and informing objectives concurrently (Edworthy & Adams, 1996).

The influential features of a warning are generally categorized according to intended target outcomes that define warning effectiveness, such as attention, comprehending, and complying. Attention refers to noticeability. Encoding, which supports comprehension to facilitate judgment, enables external information to be translated into some internal representation through reading words and processing symbols (Rogers et al., 2000). Compliance, the ultimate measure of success for any warning, is sensitive to not only the cumulative features of the warning label itself, but also the context and individual characteristics affecting belief systems, values, and judgments.

In fulfillment of the functions to alert, inform, and instruct, researchers manipulate and apply various features such as pictorial (symbol), alerting icon, signal word, and message text. Consistent with the theory behind the warning design models, the desired outcomes of the warning include gaining attention, being comprehended, and forming judgments to potentially induce compliance.

Communicating the instructions: Symbols. The American National Standards Institute (ANSI, 2002) defined a symbol as a "configuration, consisting of an image, which conveys a message without the use of words" (Rogers et al., 2000). Accordingly, the word symbol includes graphic art, such as pictograms, pictorials, and glyphs. A symbol panel may include a safety symbol with or without a colored background with an optional surround shape (Deppa, 2006). Yet, the inclusion of a surround shape may interfere with the legibility of the actual symbol or impose limitations on amount of text, because of space. Surround shapes and color are customarily applied when prohibition symbols are used, which is distinguished by a diagonal band inside a circular band. Other types of typical symbols used in warning signs are signal icons that serve as safety alert symbols, such as an image of an exclamation point or a skull (Amer & Maris, 2007; Wogalter et al., 2006). One advantage of symbols includes the ability to be flexible in design so that the image can be correctly comprehended by the target audience. Due to this unique quality, pictorials may communicate messages beyond language or reading literacy barriers, potentially leading to enhanced processing of the intended message by the receiver. Overall, the use of symbols adds alerting value and processing speed to warnings for achieving the functions of communicating and informing recipients of the hazards, consequences, and desired behaviors.

Warnings with icons have a higher alerting value than warnings that only include text (e.g., Ng & Chan, 2009; Rogers et al., 2000). Alerting effects may also be influenced through the use of color and borders (Davies et al., 1998). Other than self-report ratings of noticeability, alerting value has been assessed through objective measures, such as response latencies and recall rates (Bzostek & Wogalter, 1999; Laughery & Young, 1991). Response latencies in noticing simulated alcohol warning labels, for instance, revealed that pictorial, color, signal icon, and border lead to significantly faster response time than warnings without them (Young, 1991). Although non-significant improvements were observed with the singular addition of these elements, the addition of a pictorial alone, improved decision time by 29%. Warning labels that draw attention more quickly result in longer dwell times leading to better recall. With a sample size of 200 daily smokers, recall of cigarette advertisement with either text only or graphic warning label was measured (Strasser et al., 2012). A significant difference of recall was observed between text only and graphic warning (50% v. 83%) indicating that information was stored in memory allowing for informed decision making when the warning was not present. Overall, the noticeability of warnings contributes to the reading and encoding of messages that facilitates comprehension (Kalsher et al., 1994). Furthermore, the occupation of a smaller space may allow symbols to convey information in a manner that requires less effortful processing than if conveyed through text (Rogers et al., 2000). Relative to words, symbols that directly represent the concept can be processed easier with the use of size, shape, and color. The ease and speed in processing is particularly critical in warnings that require a very limited time to respond, such as for exit sign warnings during emergency situations (Wogalter et al., 2006).

Nevertheless, the greatest challenge in symbol design is assuring a precise match between the information that is being conveyed and the visual stimuli selected to represent it. Despite the potential advantages of visual images, studies have revealed that the comprehension level of many signs do not meet the comprehension criteria outlined by safety standard issuers such as ANSI (2002) and ISO (1997), a.k.a "International Organization of Standards". These include safety signs (Chan et al., 2011; Tam et al., 2003) and symbols employed in pharmaceutical warnings or instructions (e.g. Magurno et al., 1994; McCafferty, 1999; Ringseis & Caird, 1995). In Ringseis and Caird's (1995) study, only 4 out of 20 pharmaceutical pictorials under examination met the ANSI standards for comprehension (85%). Eighteen out of 30 pharmaceutical pictorials met the recommended comprehension levels in a sample of community dwelling residents (Magurno et al., 1994). Moreover, only three of the 42 pictorials presented were within acceptable range of the ISO 67% comprehension criterion when tested with individual with developmental disabilities living in semi-independent environments. Among the tested pictorials, including those that connoted “take with water,” “do not drink alcohol,” and “poison,” none achieved the ANSI 85% comprehension criterion. Furthermore, there were no statistically significant differences in comprehension between those who were taking the medication with bottles that displayed the corresponding pictorial and those who did not (Silver, Basin, Sexton, & Fabbi, 1998).

Finally, McCafferty (1999) conducted a comprehensive study concerning the perceived readability, understandability, and hazardousness of prescription drug warning labels. In this study, 43 pharmaceutical pictograms categorized under body parts, ailments, and directions were rated in effectiveness, including perceived hazardousness and understandability. The test icons that were most effective met the ISO (1997) 67% criteria, but not the 85% ANSI (1998) criteria. Icons representing “shake well”, “poison”, “should be taken with plenty of water”, “for headaches”, “do not drink alcoholic beverages”, and “for the ear” met the ISO (1997) 67% comprehension criteria. This was consistent with previous research which found that icons conveying “do not drink with alcohol,” “poison,” and “take with water” met adequate comprehension rates (Silver et al., 1998). Although icons consisting of identifiable objects were found to be higher in effectiveness overall (e.g. “For eyes” and “Do not drink alcoholic beverages”), certain icons that were rated high in perceived hazard were not easily interpreted by respondents. These included pictorials that represented “For water retention”, “For anxiety”, “For infection”, “Not to be taken by mouth”, and “Do not take aspirin without..”. McCafferty (1999) examined the factorial combination of different background colors (red, blue, and orange) with variations of icon (icon alone, icon with slash, and no icon at all), and text. It was found that icons with a slash were rated highest in perceived hazardousness and yellow background with black print was highest in readability and understandability among those who take prescription medication. She further noted that the ambiguous nature of certain icons may unnecessarily lead to an increased perception of hazard relative to more straightforward icon.

Similarly, Davies, et al. (1998) examined safety pictograms regarding their level of understandability and their role in conveying consumer safety information. Subjects were asked to the judge level of comprehension of 13 product related pictograms by explaining the meaning of the safety pictogram, the nature of the hazard, and the necessary action to be taken to comply with the safety message through free responses. They ultimately found that safety pictograms were generally poorly understood.

Thus, instances in which conspicuous pictorials may be ineffective in currently used warnings are largely due to their inability to be comprehended and encoded into memory by recipients. Features that enhance both legibility and explicitness facilitate comprehension and compliance, because they relate to accurate interpretation and effortless identification from surrounding stimuli (Wogalter et al., 2006). Large, bold, and simple pictorial qualities are typically implemented for legibility, but can also contribute to conspicuity provided that unnecessary details that may cause confusion or disorder are minimized. Accordingly, well-designed pictorials have the potential to communicate concepts and instructions at a glance (Childers & Houston, 1984; Young & Wogalter, 1990) when the size is large enough to communicate the message at the intended viewing distance (Ng & Chan, 2009; Rogers, 2000) and the design is simple and clear from unnecessary visual clutter using gestalt and minimalist principles (Loring & Wiklund, 1988; Ng & Chan, 2009; Rogers, 2000). Similarly, the communication of information that is specific, understandable, and interpretable is represented by explicitness (Chan et al., 2011; Laughery & Wogalter, 2006; Redstrom, 2006). Explicitness can be achieved through the use of graphic images (Hammond et al., 2006) and have a strong relationship with perception of severity (Hammond et al., 2006; Laughery et. al., 1993). For instance, the communication of health risks associated with smoking is facilitated by the use of graphic warnings that are larger and contain more detail (Hammond et al., 2006). Furthermore, graphic warnings were found to increase reading and noticing, thoughts of harm and quitting, and behavioral responses such as passing up cigarettes (Borland et al., 2009). Effects were sustained longer by stronger warnings in a comparison between Australia and Canada. Moreover, even the use of cartoon characters in smoking warnings has been found to be more effective than plain text (Duffy & Burton, 2000). Nonetheless, there are a multitude of design approaches that can influence conspicuity, legibility, and explicitness.

To approach the relationship between symbol design features and comprehension systematically, dimensions including familiarity, concreteness, simplicity, semantic distance, and meaningfulness have been identified as a distinct and measurable feature by warning researchers (Mcdougall, Curry & de Bruijn, 1999). Recent research found that semantic distance, concreteness, familiarity, and visual complexity account for 69% of the variance in terms of both noticeability and comprehension accuracy (Isherwood et al., 2007).

Complex icons consist of fine or irrelevant details (Wogalter et al., 2006). Although simple signs may be more comprehensible than complex signs (Chan et al., 2011), this cognitive feature was not found to affect comprehension relative to other factors in terms of performance (Isherwood et al., 2007; McDougall et al., 1999). This may be explained by the need for symbols to be detailed enough to communicate the intended message accurately, yet succinct enough so as to not delay processing time. Nevertheless, research findings generally assert that simple designs are more beneficial with regards to response times during visual search tasks, due to the ease in mental processing. The drawbacks of complexity were evident when the symbol had to be detected from a display containing a number of competing stimuli as opposed to when the meaning had to be identified (McDougall et al., 1999). However, to accelerate response time, highlighting relevant information in complex signage may attract and guide viewers in discerning its intended purpose. This was evidenced in escalator safety warnings which highlighted areas in the illustrations where hands should be placed (McDougald & Wogalter, 2011).

Whether the message is represented through concrete or abstract symbols often depend upon the nature of the concept. In general, abstract concepts are often paired with abstract symbols that utilize shapes, arrows, and lines, because of the challenges in visualizing the message (Dewar, 1999; Mcdougall et al., 1999). For example, an abstract symbol, consisting of three overlapping circles, is often used in depicting biohazard, an abstract concept. An abstract symbol was applied to biohazard, based on the decision that the symbol must be able to draw immediate attention, be unique so that confusion with other symbols are prevented, be quickly recognizable and easily recalled, be identical from all angles of approach, and be acceptable to groups varying in ethnic backgrounds (Baldwin & Runkle, 1967). Conversely, concrete symbols are usually applied for concrete concepts, to assist in enhancing comprehension, such as a picture of a printer used to denote the function of print or of an eye to denote “for the eye”. Nonetheless, there are findings suggesting that concrete symbols should be applied to abstract concepts when possible (e.g. McCafferty, 1999). For example, “biohazard” depicted by a picture of a broken hypodermic needle, a concrete symbol, outperformed the aforementioned abstract conventional symbol despite it not reaching the level of comprehension required by ANSI Z535.3 standards

(Leonard, 1994). However, due to the limited types of functions and messages that can be represented pictorially, concreteness may often be difficult to achieve. The poor comprehension of currently used pictorials for chemical hazards, safety and pharmaceutical warnings, for instance, has been attributed to abstractness (Banda & Sichilongo, 2006; McCafferty, 1999; Ng & Chan, 2009; Silver, Wogalter, Brewster, Glover, Tillotson, & Temple, 1995).

Alternatively, a concrete icon may not always lead to the correct identification of the function (McDougall & Isherwood, 2009). When participants were presented with the portable file symbol, they interpreted it as a sign for luggage storage. Furthermore, access to meaning is much more difficult when items, although concrete, are not familiar. For example, a jacketed reactor, an item not familiar to most, is also more challenging for people to identify its meaning. Though concrete objects contain more intricate details, concreteness and complexity are regarded as different dimensions (McDougall et al., 1999). Thus, in terms of icon design, concreteness exceeds complexity with respect to reaching adequate comprehension levels. If an adopted symbol or concept it connotes is abstract, then understandability may only be achieved through familiarity, which may be acquired either through experience or training (McDougall et al., 1999; Wogalter, Sojourner & Brelsford, 2010).

Other than concreteness, designers have been advised to focus more closely on conceptual mapping between icon and function or semantic distance. Semantic distance is a measure of the closeness of the relationship between the symbol and what it is intended to represent (McDougall et al., 1999), but is not equivalent to meaningfulness. For example, the picture of a printer may signify print and have close semantic closeness as well as meaningfulness. However, a triangle signifying hazard ahead may be meaningful to subjects due to familiarity, but is regarded as lower in semantic closeness, because of the low relationship between the function it represents and the symbol. Formation of strong referential links between visual (icon) and verbal (function) was found to be not only an important predictor of the accuracy, but also time to name pictures (Johnson et al., 1996). However, if there are several possible names for a picture, then the time taken to name a picture increases. An example of this would be a picture of a rabbit that is intended to convey fast. In this instance, the semantic distance is far, because receivers would have to infer the meaning of the symbol. In cases when semantic distance is reduced, adding a short verbal statement that assists in interpretation would be ideal. It was found that semantic distance, as opposed to other characteristics such as concreteness, may be more beneficial when icon function relationships are initially learned (Isherwood et al., 2007; Ng & Chan, 2009).

When semantic distance is limited, familiarity assumes a stronger role. Familiarity was found to have statistically significant influences on response rate relative to semantic distance and concreteness (Isherwood et al., 2007). In addition to response rate, familiarity in terms of function identification was related to accuracy. McDougall and Isherwood (2009) suggested that semantic distance and familiarity appeared to be the major drivers of accurate icon identification. Yet, Chan et al. (2011) excluded semantic closeness and found that in addition to meaningfulness and concreteness, familiarity had a high correlation with comprehension. Consistently established as a major influence on comprehension as evidenced by decreased response times and increased clarity, familiarity may be strengthened through standardization. Applying similar colors and shapes to a collection of icons that perform similar functions and representing similar types of information facilitates familiarity. To effectively communicate no exit under conditions requiring quick decisions, variation among carefully selected exit symbols must be minimal (Rogers, 2000). In road signs, for instance, triangles traditionally convey caution whereas circles are associated with road safety instructions (Duarte & Rebelo, 2005; Ng & Chan, 2009). For drivers with normal vision, traffic signs can be recognized with an exposure duration of 50 milliseconds (Avant, Theiman, Brewer, & Woodman, 1986). Hence, familiarity is important for symbols that must be attended to and understood within a short duration.

Powerful effects of familiarity are evident by the finding that infrequent traffic signs are more likely to be miscomprehended and less likely to be correctly learned by drivers (Chan et al., 2011). Although the comprehension level of many safety signs did not meet ISO and ANSI standards, driving experience was a significant predictor of sign comprehensibility over a variety of variables, including age group, gender, educational background, occupational experience, safety professional background, and safety education background. In addition, the examination of different versions of negation icons (red circle with a slash) has found that over and under slashes where preferred to other formats of slashes, such as translucent or partial slashes due to familiarity (Murray et al, 1998). Warning researchers widely recommend that designers use familiar symbols as much as possible, with the caveat that what is familiar to one person may not be familiar to another (Chan et al., 2011; Rosson & Carroll, 2002).

This recommendation is applicable in the design of warning labels for products that are used abroad. In a study regarding prescription drug icons in a South African area where the majority of the population has limited education and literacy, icons that were most familiar with or used locally were more effective than icons that were developed by the governing pharmaceutical entity (Dowse & Ehlers, 2001). If familiarization is not achieved through personal experience, and training is neither practical nor feasible, designers may have to resort to re-design and testing of new symbols. Due to the heavy dependence on a collection of factors such as meaningfulness, semantic distance, concreteness, and familiarity, the introduction of new pictorials, particularly for functions that are unfamiliar or performed less, is challenging.

Furthermore, symbol comprehension impacted by other potential demographic influences has been evaluated. For example, Hancock et al. (2001) used a phrase generation procedure to examine the comprehension levels of safety symbols between younger (18 to 23 years old) and older (64 to 75 years old) participants. The safety symbols comprised of four different classifications: hazard alerting (warn against specific hazards like electrical shock), mandatory action (wear protective goggles), prohibition (no open flame), and information symbols (fire extinguisher – related to general safety). In addition to the finding that the comprehension rates for both groups were lower than ANSI standards, older participants, who generated significantly fewer phrases, performed worse than younger participants with regards to understandability. Although there were some symbols that were better understood by younger participants than older participants, prohibition symbols consisting of a circle with a slash may be better suited to a general population over other types of symbols, such as hazard alerting symbols. Hancock et al. (2004) indicated that the findings were consistent with those that found age deficits in comprehension with respect to railway station signs (Zwaga & Boersma, 1983), medication bottles (Morrell et al., 1990), and consumer products (Easterby & Hakiel, 1981; Hancock et al., 2005).

In addition to differences in experience or age, differences between disabled and non-disabled persons have been explored. For example, Hoonhout (2000) concluded that more concrete symbols were better understood by adults with mild mental developmental disabilities. Unsurprisingly, those without mental disabilities outperformed the latter group under testing conditions using comprehensibility and a matching test. However, the authors found it noteworthy, instead of providing the meaning, those with mild mental disabilities provided a description of the symbol, indicating that realistic, concrete, and simple symbols should be applied to this target group. A recent study by Duarte et al. (2014) tested the comprehensibility of messages that were conveyed through a graphical symbol and a surrounding shape-color background. Although those with cerebral palsy scored lower than adult workers and college students, there was consistency across the three groups with regards to inferior and effective symbols. The highest comprehension scores for each of the three groups studied, adult workers, college students, and cerebral palsy were given to the same pictures: protective mask required, high temperatures hazard, and reagent to the water. Similar patterns were also seen in images receiving the lowest scores: fire blanket symbol (flammable, rather than purpose of providing a blanket), eyewash station (complexity), do not disconnect (technical and engineering concept).

Overall, pictorial symbols are necessary in communicating safety information in a variety of areas including transportation, industrial environments, and consumer products so that critical information can be extracted when needed. However, a variety of factors can affect understandability such as culture, age, and visual or mental abilities. Collectively, the research has indicated that the best symbols leading to the highest comprehension are those that are concrete, meaningful, familiar, and have high semantic distance to the referent hazard. In general, prohibition symbols (e.g. "do not exit") were comprehended the best and hazard alerting symbols (e.g. "poison") were worst (Hancock et al., 2004). Selected symbols must not only be noticeable, but also legible so that receivers can discern what the message is about. Symbol explicitness, on the other hand, refers to the symbol's information accuracy regarding the target hazard and the associated risks. In many cases, the higher the severity of the risks conveyed, the higher the probability of compliance (Wogalter et al., 2006). Signal icons and signal words are other common components of a warning label that may be applied to assist in enhancing warning effectiveness.

Communicating the risk: signal icons and signal words. More recent studies have examined signal icons in computer interfaces. Signal icons are symbols that communicate the level of hazard presented by the warning icon. Hazard matching in this field of research occurs when the severity of the hazard that is implied match the level of danger faced by the user within an application control-exception message (Hellier et al., 2000). An application control-exception message is a message often presented to on computer interfaces to warning users of potential consequences or when a user performs an unexpected action. Hazard matching improves the ability of the warning to match the arousal strength or the severity of hazard a warning communicates to the appropriate hazardous situation or conditions. By raising the perception of hazard in appropriate circumstances, compliance can be increased (Rogers et al., 2000). Due to their ability to increase overall salience in a warning (e.g., Amer & Maris, 2007; Hellier et al. 2000; Wogatler et al., 1998; Wogalter and Laughery, 1996; Wogalter & Silver, 1990), signal icons and signal word combinations were evaluated to assess hazard matching accuracy. The section of the warning label that contains the signal icon and signal word is called the signal word panel (Wogalter et al.., 2006).

Amer and Maris (2007) examined arousal strength associated with signal words and icons that appeared in exception messages on computer screens. They tested 316 participants who each viewed exception messages containing combinations of signal words and icons and provided their perceptions to the severity of a computer problem communicated. They found that different combinations of signal words (NOTICE, ERROR, WARNING, URGENT, AND CRITICAL) and signal icons (i, ?, !, X) increased the arousal strength of an exception message associated with a computer problem. These features allowed the severity of hazard implied by the exception message to match to the level of the threat presented. Thus, identifying the factors that lead to a desired arousal strength can assist in the design of the appropriate combination of signal word and icon for an informational technology (IT) application control related hazard. In addition to increasing compliance, increasing the arousal strength of the exception message using appropriate signal word and icon combinations may minimize habituation effects. Habituation effects refer to the decrease in attention and compliance due to repeated exposure of a message or warning whether present via computer or label form (Amer & Maris, 2007; Hellier et al., 2000; Silver & Wogalter, 1989). Amer and Maris (2007) found the difference in compliance rates high at 97% hit rate of a non-habituated control group as opposed to 11% for those who received repeated exposures of similar exception messages.

Nevertheless, mixed outcomes from icons, signal icons, and signal words in warnings indicate that their effects on understandability and compliance may be minimal or be heavily influenced by context. For instance, signs combining signal words and signal icons were not found to be statistically significantly different from those signs containing the same signal words without signal icons (Kalsher, Wogalter, Brewster, & Spunar, 1995). Interestingly, those with the signal word only signs were found to be slighter higher in hazard perception ratings. However, the signs that contained the signal word DEADLY with the skull icon were consistently rated highest in severity perceptions by subjects (See Figure 2). Thus, further research regarding the combination of signal words and signal icon is warranted, because the value of the addition of signal icons is still under question (Amer & Maris, 2007). However, there is strong evidence revealing that warning messages are often attended to when accompanied by signal words (Lim & Wogalter, 2004).

According to standards developed by ANSI Z535.4 (2011), DANGER, WARNING, and CAUTION, are the recommended signal words, in order of decreasing hazard levels. Research has provided strong support that the use of signal words adds alerting value and informational value for audiences to make sound decisions (Silver & Wogalter, 1989; Wogalter & Silver, 1995). In an investigation of printed warning statements containing signal words alongside hazard and instructions, statements paired with a signal word were rated higher on intended carefulness than statements without a signal word (Lim & Wogalter, 2004).

Thus far, there is a considerable body of empirical research that has scrutinized the signal word guidelines provided by ANSI (2002). In terms of arousal strength, for instance, results seem to consistently show that there is very little difference between the recommended ANSI signal words, WARNING and CAUTION, with DANGER receiving the highest ratings in hazard as expected (Silver & Wogalter, 1989; Wogalter et al., 1994). Similarly, Young (1998) argued that hazard perceptions of signal words dictated by American and International Standards were not consistent with empirical research. DANGER was considered more hazardous than CAUTION and NOTICE, but not WARNING. WARNING was perceived as significantly more hazardous than NOTICE, but not CAUTION. CAUTION and NOTICE did not differ from one another in term hazard analysis rankings that were independent of context. When subjects created warning panels based on 30 verbally described scenarios with the aid of a technician, DANGER, DEADLY, and LETHAL were more likely to be used in severe than in non-severe scenarios (Young, 1998). NOTICE and CAUTION were more likely to be used in non-severe than in severe scenarios. Moreover, WARNING did not appear to be applied based on the severity of the scenario. Thus, there is a large body of research within the warning literature revealing that the three tiers of hazard connotation dictated by ANSI is not consistent with the associations fostered within the general population as suggested (Leonard et al., 1986; Wogalter & Silver, 1990; Wogalter et al., 1992, 1994; Wogalter & Silver, 1995; Young, 1998). Consequently, based on the population's perceptions of signal words as demonstrated by these studies, it was recommended that signal words be parsed into two or three tiers (Young, 1998). The two tiered approach would consist of DEADLY, LETHAL, and DANGER vs. CAUTION and NOTICE, whereas the three tiered approach would include DEADLY or LETHAL vs. WARNING vs. NOTICE.

Nevertheless, within the general population, there seems to be differences in interpretation between different types of groups. For example, the perceptions of signal words varied between gas station attendants and college students (Goldhaber & deTurck, 1988; Young, 1998). The differentiation between WARNING and CAUTION was also found between non students as opposed to students (Young, 1998). Another study compared the strength and understandability of signal words among children, elders, and non-native English speakers (Wogalter & Silver, 1995). In this study, non-native English speakers rated CAREFUL higher on carefulness than did elderly. Conversely, elderly rated DEADLY higher than did non-native English speakers. Although the pattern of ratings was generally similar across groups, it was suggested that elderly and grade school ($4^{th}$ and $5^{th}$) gave higher ratings, perhaps due to a heightened sense of vulnerability inherent in these target groups. Because the elderly have more experience with pharmaceuticals and medical devices, they may have developed the ability to discern the differences between the meanings of WARNING and CAUTION (Wogalter & Silver, 1995). Yet, in a comparison between hazard perception for different signal words between Chinese and American populations, very little differences were found between ranking scores (Yu & Chan, 2004). There were additionally no significant differences among the three signal words, WARNING, DANGER, and CAUTION, found within developmentally disabled subjects (Silver, Tubillleja, & Ferrante, 1995). Together, these findings confirm that the selection of warning signal words requires careful thought not only with regards to appropriate hazard matching, but also with regards to the context of the target population.

Expansion of signal words to attend to these issues has been undertaken by researchers so that the probability and level of severity of consequences can be accurately communicated. Silver and Wogalter (1989) assessed 84 terms on strength, severity of implied injury, likelihood of implied injury, attention-gettingness, carefulness, and understandability, which resulted to a condensed list of 20 usable terms. For warnings that are informational in nature or presents low severity or probability risk, it was concluded that words such as REMINDER and NOTICE may be considered more appropriate than WARNING or CAUTION. For more threatening situations, HAZARD and UNSAFE may be more suitable. Furthermore, an expanded list of signal words may alleviate the potential problems of habituation from overuse of the currently recommended terms, because selecting an appropriate, but more novel word may be more salient.

Reinforcing the meaning: warning message. To improve understandability of warnings, icons, signal icons, and signal words are often accompanied by a message. Similar to symbols, there are unlimited configurations of formats and characteristics that can be manipulated in warning design. Factors such as size and location are customarily evaluated after an effective combination of symbols, text, and design elements are identified through rigorous empirical testing. Therefore, in adherence to this paper's proposition of creating a novel warning label in efforts to communicate a hazard, research restricted to message explicitness, length, and readability, will be reviewed.

***Explicitness, length, and readability.*** Written text can provide or reinforce the important details in a warning with regards to instructions, consequences, or company practices with or without the presence of symbols or other alerting features. When symbols exist, written text can clarify the connotation of a symbol to assist in minimizing misinterpretation. Warning label text may also be useful in manipulating the perception of hazard to influence judgments or compliance. A higher degree of detail in the description of potential injury, consequences, or instructions increases text explicitness. For example, the message, "This is hazardous to your health" is less explicit than warnings that describe the specific consequences, such as "this may cause lung cancer". "Consume with adequate water" can be made be more explicit by communicating that eight ounces of water should be consumed. Similarly, messages in consumer products, such as "Keep away from open flame", are non-explicit, because an open flame can mean a variety of situations, such as pilot light, a match, a fireplace, etc. Analogous to symbol explicitness, text explicitness heightens interpretability through communication of specific and concise textual information, thereby minimizing the need for inferences. Greater text explicitness is associated with greater levels of perceived dangerousness, hazard understanding, injury severity, manufacturer's concern, and increased intent to act cautiously in a study using familiar products (Laughery et al., 1993). The effect of explicitness on attention to and compliance with on-product warnings can be dramatic. For instance, Frantz (1994) found that explicit and lengthier precautions increased reading rates from 4% to 78% and compliance rates from 10% to 65%. In a later study, Heaps and Henley (1999) tested prototypical warning labels in a hypothetical household cleaner. Explicit versus implicit consequences, as well as probabilistic versus definite statements were examined. Results indicated that label believability is positively influenced by explicit statements portraying the specific hazard and the worst possible consequences. Furthermore, definite (i.e., preceded by “Do not”) rather than probabilistic (i.e., preceded by “Avoid”) statements of consequences increased label believability. Aside from explicitness and issues regarding probabilistic or definite positioned instructions, other variations include the use of a personal pronoun, such as statements beginning with “You should..” was examined by Edworthy, Hellier, Morley, Grey, Aldrich, and Lee (2004). Instruction statements using the personal pronoun resulted in highest levels of compliance with pesticide warning labels. Warnings with a direct reference to an individual lead to higher compliance compared to a warning containing no reference to the individual (Wogalter et al., 1994).

For more complex types of instructions or products, an appropriate level of explicitness may require extending the text length. Silver et al. (1991) found a positive correlation between message length and willingness to read a warning for pest control products, indicating that longer warnings on hazardous products are more likely to be read. Although longer messages may provide more explicit content, there may be some instances in which longer messages may be less suitable. In examining comprehension and retention of safety pictorials, for instance, Wogalter, Sojourner, and Brelsford (2010) tested the comprehensibility of safety pictorials among undergraduate students using 40 industrial-safety and pharmaceutical pictorials that were pre-tested for understandability. The training procedure involved providing pictorials with an associated verbal label or a verbal label plus a more detailed explanatory statement to enhance comprehension and retention. Results revealed that detailed and additional verbal information provided by lengthy explanatory descriptions did not produce greater memory of pictorial meanings than pictorial labels alone. Despite several potential limitations cited by the authors, such as sensitivity of retention test, and ceiling effects in verbal label alone scores, the findings confirmed that adequate encoding may be hindered by lengthy explanatory statements.

Appropriate encoding may also be affected by other factors such as font size, placement of message, and general readability. Specifically, text complexity, with regards to level of vocabulary comprehension, is an important feature to investigate in the design of a novel warning icon. For instance, combustible, flammable, and very flammable are standardized warning terms used by the National Fire Protection Agency (NFPA) to indicate the likelihood of ignitability from lowest to greatest, due to differences vaporization temperature points (Main, Frantz, & Rhoades, 1993). In selecting the more dangerous of two charcoal lighter fluids labeled flammable and combustible, only 24% selected flammable as the most dangerous of the two terms. Moreover, 26% of subjects viewed them as equivalent (Main et al., 1993). This was consistent with an earlier study by Leonard, Creel, and Karnes (1991), which found great variability in understanding terms such as flammable (61% comprehension), radioactive (19% comprehension), and corrosive (19% comprehension). Overall, vocabulary level should always be weighed particularly when there is a specific target audience in mind.

Warning messages that are conveyed through text fundamentally reinforce the explicitness of the information conveyed by the warning label – in unison with other components such as the pictorial, signal icon, and signal word. Explicitness assists in the presentation of various types of information, such as instructions or consequences, in efforts to alter judgments and ideally lead to compliant behavior. However, when applying explicitness to warning messages, factors such as length of message, readability, and content must be taken under consideration. Similar to research findings associated with the aforementioned warning label components, devising text for warning labels is strongly context dependent. According to warning effectiveness models, individual and environmental factors, which are independent of the warning itself, may heavily influence behavioral compliance.

## Contextual Factors Affecting Behavioral Compliance

Situational and individual factors may affect behavioral compliance, independent of the warning itself. These can largely be controlled by measures aimed in designing out or guarding against the hazard as described in the hazard control hierarchy, through measures such as laws, policies, and other forms of procedural changes. A variety of factors associated with behavioral compliance, include cost of compliance (Argo & Main, 2004), modelling (Laughery & Wogalter, 2006), and source of message (Munoz et al., 2010).

Cost in terms of time and difficulty influenced the use of eyewear protection when manipulating both warning sign and compliance costs (Dingus et al., 1993). When the location of safety equipment was readily accessible, compliance increased substantially when the amount of information regarding consequences increased on the label. Compliance of warning and no warning conditions were 100% and 81%, respectively, demonstrating the strong influence of compliance costs.

Hence, certain tasks may require that warnings be displayed during the performance to assist in maximizing effectiveness in terms of compliance. In a field study that required participants to perform a task, 98% of participants noticed a warning located on a file cabinet associated with the task (Frantz et al., 2000). In this experiment, the performance of the task was interrupted, because the warning about a file cabinet was taped across the drawers and needed to be removed before use. Compliance of interactive warning labels was also found in which the warning had to be physically removed when a computer disk drive task was performed

(Wogalter, Barlow, & Murphy, 1995). These findings correspond to more recent studies involving advanced technology. Interactive warnings were observed to be effective in video monitor displays and IT applications (Amer & Maris, 2007; Floyd et al., 2006). When the benefits of not conforming to particular warnings may appear to outweigh the risks, such as engaging in Internet exchanges and alcohol consumption, attending to upheld belief systems and attitudes, such as self-efficacy, may be effective in influencing behavior.

Self-efficacy, the perceived capacity to perform the behavior proposed the warning (Munoz, Chebat, Suissa, 2010), may be associated with warning compliance. Self-efficacy may be strongly impacted by personal experiences with the product, which would strengthen product familiarity. The greater the perceived hazard of the product itself, the greater the likelihood that people will look for and read warning information, such as in the case of some pharmaceutical products (e.g. Laughery, 1993, Wogalter et al., 1996). Heaps and Henley (1999) found that the participants in the explicit statement condition neither thought it was any more important to follow the product's directions for proper use nor less likely to use the product when they knew of the hazard causing agent. Similarly, the more familiar women were with tampons, the less likely they noticed warnings regarding toxic shock syndrome, because of safe experiences in the past (Godfrey & Laughery, 1984). Thus, hazard perceptions seem to be negatively correlated with familiarity, and greater familiarity reduces the likelihood of seeing or reading a warning on a same or similar product (Laughery & Wogalter, 2011).

Offering information that targets irrational beliefs were found to be a viable resolution in modifying self-efficacy with regards to gambling behavior. For instance, gambling losses were decreased when warnings targeting irrational beliefs were presented to subjects (Floyd et al., 2006). These irrational beliefs included statements, such as "The result of any spin has nothing to do with previous spins" and "Winning is completely due to chance. No luck is involved."

In addition to targeting irrational beliefs, modelling may impact self-efficacy, such as in illegal downloading behavior (LaRose & Rifon, 2007). Individuals observing others who are not heeding a warning and are not punished by an accident or other form of consequence may lead to the modeling of unsafe behavior (Edworthy & Dale, 2000; Laughery, 2006). This is especially the case if obeying the warning would require the expenditure of time or resources (e.g., money). Alternatively, if one observes others conforming to the behavior required of the warning, one may assume that the behavior is being rewarded by avoiding the possible consequences of the hazard. In such a case, safe behavior will be modeled (Leonard & Karnes, 1999). Furthermore, stress arising from time pressures and social pressures may potentially have an impact on compliance (Laughery et al., 2011).

In addition to self-efficacy, which is strongly related to observations of others or past experience, research has shown that level of involvement may have an influential impact on behavioral compliance. Level of involvement refers to the extent to which the information is processed and influenced due to motivation and relevance to the individual. This has been shown in a wide variety of risk communication areas such as cigarette smoking (Hammond et al., 2006), gambling (Munoz, Chebat, & Borges, 2013), and various other products (deTurck, 2002). Although involvement can be increased by indicating to individuals that their activities are being observed by others, it can also be strengthened by clearly communicating consequences through graphic or textual form.

For instance, to facilitate safe downloading behaviors online, it was recommended that the risk and consequences, such as loss of money and property, should be explicitly described in text to computer users (Hardee et al., 2006). Brief interactive warnings supplemented with an educational video addressing irrational beliefs and attitudes that were effective in changing gambling behavior (Floyd et al., 2006) may be applied to illegal downloading behavior. In this respect, emphasizing the severity of the potential legal ramifications of the behavior may serve as an effective deterrent. Nevertheless, despite the best efforts to prevent certain behaviors, the most effective mechanism for control is ultimately the individual's self-motivation (Ariyabuddhiphongs, 2013).

An individual's credibility and trust in the product or the source of the warning message may induce the motivation to comply (e.g., Horst et al., 1986). Gambling warnings from a video gaming provider were least trusted in comparison with those endorsed by external sources that perceived to have greater interests in public welfare, such as a medical source (Munoz et al., 2010). In relation to online activities, the presence of an icon, such as a privacy seal, may mislead consumers into decreasing perceptions of risk associated with information risk and disclosure, even when a contrived privacy warning was present (Larose & Rifon, 2007). Because this study exposed the widespread misunderstanding of what privacy seals actually assure, researchers recommended that privacy warnings should be developed in efforts to promote consumer privacy self-regulatory behaviors (Rifon, LaRose, & Choi, 2005). In general, people do not read privacy notices when they are not trusted (Milne et al., 2006).

In summary, compliance is affected by a variety of situational and individual factors. Situational variables can influence the individual factors that are related with warning compliance. For example, cost of compliance and modeling, both impacted by past experience or familiarity, are associated with self-efficacy. Cost of compliance and modeling can be addressed by enforcing or increasing the legal repercussions, for instance, or increasing the benefits of conforming to the warning. Whereas time may not be a factor across all types of warnings, social pressures may be cultivated either slowly or more rapidly with the assistance of consistent and swift legal enforcement. Interactive warnings are already customarily applied in varying monitor displays. Trust in the warning, on the other hand, may be affected by the source of the message aside from other factors related to hazard perception. Because research in the design of computer icons is still in its infancy, though progressively growing, a better understanding of how design for print warnings can be implemented into computerized designs warrants closer attention. Based on literature on print warnings, Zaikina-Montgomery (2011), for instance, devised icons to deter children from viewing sexually explicit websites, which must be tested empirically across different populations in order to establish their validity. Within these populations (e.g., older and younger children), there may be potential problems in the effectiveness of the message.

## The Testing and Development of Music Piracy Warnings

This paper proposes that the current changes in the technological and legal landscape signals the need for warnings to communicate the hazards associated with copyright infringement of music. The development of warnings is necessary for a number of reasons. Due to its compact file size and ease in transferability (Chiang & Assane, 2002), sound recordings were among the first forms of media subjected to infringement (Hong, 2007); thus, justifying the development of an icon designed for music piracy over other types of intellectual property, such as videos and books. Furthermore, it is clear that the vast majority of current engagers range from early adolescents to young adults, who are by nature risk-takers compared to other segments of the population. Of note, as opposed to other forms of illicit behavior concerning tangible goods, music piracy has not been provided the time to be regulated through the underlying forces of society (Beckerman, 2009) and is not considered an immoral act by the millennial generation (Selwyn, 2008). Thus, the decline of music piracy cannot be foreseen in the near future arguably due to the growing population of technologically savvy website developers who have the capacity to identify and exploit the vulnerabilities of various computer systems and software.

Findings from warning literature can be applied to music piracy. For example, the perception of risk that is associated with music piracy can be comparable to other behaviors such as gambling or cigarette smoking. Engagers of these activities, particularly among the younger population, often adopt the skewed perception that benefits outweigh the risks. Other than obtaining music for free, benefits include the strong positive emotions evoked, such as a sense of community when exchanging music with others (Gopal et al., 2004). Furthermore, perceiving the activity as benevolent explains why knowledge of copyright laws may not affect piracy behaviors (Nandedkhar & Midha, 2011). In this respect, the method of stressing to global wide consumers the potential risks and consequences in the most severe form, may prove to be an effective strategy when designing a music piracy warning. Tan (2002) identified several types of risks associated with software piracy that may be applied to music piracy: performance (malfunction of computer), financial (loss of property or money), social (embarrassment from being caught) and prosecution (legal punishment). Although there is minimal research regarding the effect of these specific risks on music piracy behavior, several findings support that perception of risks may play an influential role, compared with other factors, such as ethical concern. Thus, the design of a conspicuous, legible, and explicit symbol accompanied by the appropriate signal word and text for music piracy is promising if information from similar contexts are applied. To date, there have been no empirical studies that test the effectiveness levels for different music piracy warning designs.

Citing Zittrain's work (2000), Lessig (2002) argued that the legal system has been slanted toward harsher legal penalties for copyright infringement as opposed to invasions of personal privacy or information by companies, despite their remarkable parallels. For instance, online privacy concerns the control of an individual's personal data over the Internet, such as medical records, in terms of accessibility and vending to third party companies. This is analogous to the control of data coveted by powerful businesses (i.e., record and motion picture companies), which is presently being sustained by stringent copyright laws and penalties. As Lessig explains, the swift and fervent support for copyright law is leveraged by financial backing toward reforming laws and by the cooperation from technological firms to defend the copyright holder. Although the debate regarding fairness is ongoing, the prospect for radical reforms to the controversial system appears to be improbable in the foreseeable future, due to strong backing from music and media conglomerates. In short, it is a matter of “following the money.’’ Given the current confluence of legal, technological, and societal variables, appropriately reminding naive consumers of all ages about the potential dangers related to music piracy should be regarded with high priority.

**Research Objectives**

The goal of this investigation was to develop a computer-based warning that conveys the message to viewers: “Do not steal (pirate) music”. Icons, with designs based on existing warning research taxonomies, will be tested for the noticeability, encodability, and potential compliance. Those icons that meet the minimum criteria for adequacy in the initial exploratory study will be re-tested in a follow up study accompanied by signal words and messages to further enhance encoding, attention, and potential compliance capabilities.

**Why communicate with icons**

Modern day writing has evolved from the earliest writing systems, which were pictographic in nature. As cultures began to intermingle, the use of pictorials became a practical and universal method of communications, particularly for public-service purposes, such as in restroom and road traffic signs (e.g., Arnstien, 1983; Caron, Jamieson, & Dewar, 1980; Smallman, 2001; Zwaga & Easterby, 1980). Due to the widespread application of icons, research on graphic representations have been of interest across a variety of industries, including pharmaceutical, technological, product design, and public safety.

Nevertheless, the definition of icon may slightly diverge across different research areas. For instance, within the field of computer graphics, icons are designed to represent data or processes within an interface system to assist an end user of various computer expertise, with such processes as graphics-based interface operating systems, network, and document processing (Gittens, 1986). In other areas, such as in military icon design, for instance, icons are defined as realistic graphic representations of their referent; whereas, symbols are defined as non-realistic pictorials. The combination of symbols that combines the best aspects of symbols and icons is referred to Symbicons (Smallman, 2001). Nevertheless, according to risk communication research, the foundation of our study, icons are synonymous with pictograms and pictorials designed to increase salience, comprehension, and compliance to hazard information (Wogalter et al., 2006). Warning symbols may depict the nature of the hazard and show the consequences in efforts to promote avoidance. Alternatively, certain symbols may convey instructions on how to avoid the hazard by depicting actions that should or should not be performed. For instance, prohibition symbols are used in conjunction with other symbols to convey the actions that should not be taken. Images that depict the actions they should take, such as the use of information symbols to convey safety equipment location and egress are described as mandatory action symbols (Deppa, 2006).

Thus, the main purpose of icons is similar to language. It is involved in the transmission of information between a sender and a receiver. Similar to verbal communication, factors such as receiver personality, attitudes, and past experiences may hinder interpretation and compliance to messages transmitted through icons (Wogalter, 2006). Furthermore, the context in which the warning icons are displayed may prevent appropriate comprehension, attention, and compliance. Therefore, rigorous testing must be applied when identifying viable icons that are effective in transmitting the target message. Regardless of these limiting factors, risk communications research has uncovered factors that may increase the likelihood of effective iconic interpretation.

To support this effort, categorization approaches have been proposed to facilitate the development of effective icons theories.

**Categorizing icon characteristics**

Across a variety of fields, such as graphic arts, human factors, and computer interaction technology, the guidelines for icon design are similar. The ground form of figure should be clear and stable. The boundary around an icon should be solid, closed, and contrast-bounded, with the corners as smooth as possible to assist in contrast between the figure ground and the underlying display (Wogalter, 2006). From a human factors perspective, warnings should be legible, conspicuous, and explicit, underscoring the need of warnings to be simple, noticeable, and specific with respect to the type of message that the icon intends to convey.

To gain a better understanding of the effectiveness of icons, researchers examined their characteristics to determine what lead to the most favorable results. This approach requires a systematic and objective procedure in distinguishing icons (Garcia et al., 1994). Features that are most amenable to objective evaluations are visibly definitive qualities, such as concreteness and complexity.

A pictorial that resembles a referent or an image that is analogous to an object, action or concept (i.e., referent) is considered a concrete icon. For instance, a simple picture of a gas pump can convey the existence of a gas pump nearby. These types of images can be referred to as resemblance icons (Rogers, 1989), photographic (Gaver, 1986), representational images (Lodding, 1983), and pictorials (Webb et al., 1989). Therefore, "concrete" is occasionally used broadly for icons that consist of a representation of physical items that are similar to its real-world counterpart (e.g. Purchase, 1998; Wang et al., 2007).

In contrast, abstract icons are those that do not depict concrete images (Lindgaard et al., 1987), but are composed of geometrically shaped figures (Blattner et al, 1989). When the images bear little or no relationship to the action, object, or concept, they are regarded as arbitrary images (Lidwell et al., 2003) or sign icons (Webb et al., 1989). Thus, arbitrary images may be specifically defined as invented images that represent concepts or objects, such as the icon consisting of three concentric circles to represent radiation (Lodding, 1983). Icons that are composed of both representational and abstract images are referred to as mixed icons or semi-abstract icons (Lindgaard et al., 1987).

Regardless of these simplified definitions, there is some debate regarding whether the symbol itself or the concept being conveyed should be taken into consideration when defining them as concrete or abstract (Wogalter et al., 2006). For example, lightning rays extending from an image of an ear may be considered an abstract icon, because it may represent a non-concrete concept, such as pain. Furthermore, although an arrow may be regarded as an abstract image by some research design experts, within the computer programming field it may be considered a concrete icon, because it is analogous to the target action (e.g., "download") (e.g., Blatter et al., 1989). Yet, if images of objects are depicted in an icon, then some pictorial experts may regard them as abstract icons, because they represent concepts that are indirectly associated with the physical objects (Lodding, 1983). For instance, a picture of a wine glass, may be regarded as an abstract icon for the concept "fragile". Thus, under certain guidelines, the graphic elements and the referent that is conveyed by the image must be taken into consideration to determine concreteness, even if the image represents physical objects.

Given the diversity of opinions, Garcia, Badre, and Stasko (1994) asserted that developing a more systematic and objective method in identifying concrete from abstract icons would assist in theory development. They based their system on the premise that a higher level of detail strengthens the connection between the icon and the representation, which may be indicated by concreteness. In contrast, icons exhibiting a less complex design would more likely represent conceptual relationships and thus be identified as abstract. The newly created metric involved the counting of components in icons representing specific programming language functions and referents such as *assignment*, *begin-end*, *case*, *for*, *if*, *read in*, *repeat*, *while*, and *write-in*. Thus, components classified as closed figures, letters, open figures (where the figure's outline is not continuous), special characters (e.g., "?" and "="), horizontal lines, vertical lines, diagonal lines, arrowheads, and arc were counted to designate a score along the concrete-abstract continuum. Although the subjective ratings were better matched with the metric score, the metric was found to be more accurate in identifying concrete icons than abstract icons (Garcia, 1996). Hence, this new system provided a procedure for the quantification of icons instead of having to rely on subjective interpretation. Nevertheless, this approach was countered with the argument that complexity and concreteness are two distinct traits that should not be merged together when characterizing icons (McDougall et al., 2000; McDougall et al., 1999).

Overall, studies concur that concrete icons are generally superior to abstract icons with regards to ease in interpretation. A pictorial that resembles a referent or an image that is analogous to the referent, whether an object, action or concept, is generally ideal, because it eases the mental processing of the intended meaning. Furthermore, swiftness and accuracy in interpretation can be facilitated by using concrete items that are typically associated with a physical object or that are visually analogous to an action (Lidwell et al, 2003). Similarly, in human interaction and computer programming language areas, concrete icons were better than abstract icons in communicating instructions to end users. With the increase in computer use since the 1980s, interfaces using icons to represent programming language constructs have been developed to allow users to build programs (Edel, 1988; Glinert & Tanimoto, 1984). Ease of learning is important for accuracy and speed of icon interpretation on computer interfaces (Kacmar & Carey, 2007). After subjects matched icons with word-processing commands, a large variety of command operations were found to be comprehended successfully using concrete icons (Rogers, 1986).

On the other hand, there is also widespread agreement that concrete icons may serve as only a partial representation of the intended message, and successful interpretation may be contingent on context (e.g., Garcia & Stakos, 1994). For instance, an illustration of a cow by itself may be meaningless or confusing to the perceiver. However, if the picture is on a milk container, then the viewer will likely correctly interpret the cow as signifying milk. Likewise, a picture of falling rocks may be successfully interpreted by a wide range of onlookers when viewed in a context-appropriate site accompanied by other types of visual stimuli indicating caution, such as through color, words, or other visual aids. Thus, supplying context to icons may assist in raising comprehension.

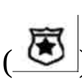
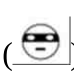
Beyond abstractness and concreteness, icons may be subjectively assessed on qualities such as familiarity, meaningfulness, and semantic distance. Icons that were previously encountered by viewers would be rated high in familiarity. However, if the icon is not familiar, then the icon can still be effective if the viewer can derive meaning from it. For instance, if a viewer did not ever encounter an icon with a printer previously, the viewer may still successfully interpret the meaning ‘to print’. Although the use of a concrete icon is generally promoted, it may not always lead to a correct interpretation. For example, a picture of a clock may be interpreted literally as indicating that there is a clock nearby or it may be interpreted figuratively to represent ‘time’.

Thus, the picture of clock may be considered high in meaningfulness by viewers. However, an image that may regarded as high in meaningfulness does not guarantee the delivery of the intended message. Thus, an icon that is interpreted with accuracy relative to other alternative icons is viewed as having greater semantic distance. Due to research findings supporting these iconic qualities, familiarity, meaningfulness, and semantic distance have been tested against criteria such as interpretation accuracy, identification ease, and recall in a variety of contexts (e.g., McDougall et al., 1999). After a review of different types of ways for measuring icon characteristics, subjective rating was considered the most comprehensive approach for quantifying the four cognitive features (concreteness, familiarity, semantic distance, meaningfulness); whereas, icon complexity can be measured objectively, such as through metric and automated measurement (Ng & Chan, 2009).

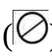
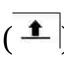
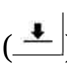
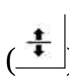
**Representational Strategies**

Alternatively, in view that icons are essentially a substitute for words, they can be categorized according to the lexical (e.g., grammatical) and semantic (meaning) properties (Nakamura & Zeng-Treitler, 2012). Lexical categorization entails grouping symbols into nouns, verbs, or modifiers. Categorization through semantic properties involve grouping icons that have a shared meaning. Lastly, icons may be categorized together by the representation strategies used to deliver the message (e.g., visual similarity or metaphor) (Nakamura & Zeng-Treitler, 2012). Because the goal of this research entails devising icons for a specific message, the design will be premised on determining the best representational strategies to pursue.

Visual similarity is demonstrated by icons consisting of images that are identical to the object that it is representing, such as the picture of an eye. This type of representational strategy is ideal if an appropriate graphic image exists for a concept, typically a noun, within a target message.  For example, in this investigation, an icon that adequately conveys the message, “Pirating music is prohibited”, would involve relaying a universal symbol that represents music. For this purpose, the best representation of music, a noun, can be the symbol of an eighth note (♫).  According to communications theory, the eighth note may be regarded as an abstract image, because a musical note represents vocal or musical sound on paper.  Due to the strong association between the image of a note and music, however, the eighth note may arguably be as effective as concrete and visually concrete icons.

As opposed to placing heavy emphasis on defining and assessing specific iconic qualities, representational strategies focus on matching the message with the appropriate strategy based on the conceptual elements.  Representational strategies assert that strong semantic associations can be achieved by using established and familiar images, whether concrete or abstract in form.  If using established and familiar images is not possible, then semantic distance can be enhanced by applying an icon that may be visually identical or have strong relations to the concept, particularly if the concept is classified as a verb, adjective, or modifier.  This can be accomplished by employing images in which swift associations can be formed, using other literary-based techniques, such as metaphor or analogy (Nakamura & Zeng-Treitler, 2012).  For instance, a picture of a rabbit may effectively be interpreted as meaning “fast” for viewers, as opposed to being interpreted literally. Similarly, an image of trees with branches may be used to represent genealogy.  When applied to this investigation’s purpose, “illegality” can be denoted with concrete icons, such as a badge () and a bandit (), which are intended to be interpreted metaphorically.  However, because these graphic representations are not typically used with other visual elements of the icon, there is a possibility that misinterpretation by the viewers may occur.

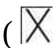
If it is not possible to use a familiar or established image, then a strong referent connection may be achieved by abstract or arbitrary images through cultural norms or training. Referents may constitute activities, processes, or entities that are conveyed within a target message. Abstract images may include common signs such as those signifying male and female symbols or other pictorials that may consist of familiar geometric shapes (e.g., arrows in recycling icon) or letters (e.g., "P" for parking), because they have no real connections between pictograph and referent.

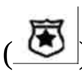
In this investigation, a combination of concrete and abstract symbols will be applied in the icon to denote the target message, "Pirating music is prohibited" (See Appendices A and B). However, in keeping with the conditions of explicitness or clarity in the message, the target message was modified to specify the actions that were prohibited: "Do not illegally download/ upload music." For instance, the prohibitive sign (), consisting of a circle slash will be used to denote "Do not". This symbol will be compared with the effectiveness of two crossed slashes (), a less widely used sign to denote prohibition will be used in this investigation (Freeman & Wogalter, 2002). Furthermore, the upload action symbol () will be tested against the download action symbol (), both of which are commonly used symbols used in computer interface systems. However, other less familiar abstract symbols will be tested against the familiar symbols. For instance, a single symbol to denote both upload and download () was created to assess its effectiveness against the two more common action symbols.

**Icon Effectiveness**

Across the risk communication literature, there is general agreement that icons have the ability to be noticed and encoded successfully. Thus, the graphic should consist of visual elements, such as well-defined boundaries and appropriate size, to enhance legibility. In addition, aiming for a simple design would help reduce extraneous details that may obstruct proper encoding (Wogalter et al., 2006). Furthermore, the message that the icon represents must be explicit or clear, which can be assessed by examining interpretation accuracy.

**Comprehension.** The combination of legibility, explicitness, and simplicity activates knowledge or comprehension in icons. Icon comprehension indicates that the viewer accurately interprets the intended message, which is potentially assured through the use of familiar symbols. In general, familiarity reflects beliefs, knowledge, and experience in a particular domain (Wogalter et al., 2010). Therefore, familiarity with an icon is established when a viewer has numerous encounters with the icon bearing the same meaning.

One of the more familiar symbols that will be used in this investigation is the circle slash prohibition symbol ( 🛇 ). In comparison to prohibitive icons consisting of a red circle, it was found that a red circle slash was more effective in indicating “no” (Ribar et al., 2007). However, there are mixed results regarding whether the slash should be over or under the base pictorial (e.g., Abdullah & Hubna, 2006; Kurniawan, 2000; Murray et al., 1998; Shieh & Huang, 2003). The mixed findings were attributed to the obscuring of important components of the pictorial. Misinterpretation can be avoided by adjusting the size of the pictorial such that it is greater than 50% of the inner diameter of the circle (Shieh & Huang, 2003). Alternatively, using pictorial images that are more concrete, less complex, and familiar, such as the action icons (e.g., “upload” and “download”) used in this study, may lead to greater comprehension when used in combination of a circle slash symbol (Wogalter, Murray, Glover, & Shaver, 2002). Similarly, using solid or closed pictorials as opposed to outline pictorials can facilitate comprehension (Shieh & Huang, 2003). Despite the mixed conclusions regarding understandability of icons with over slashes in comparison with translucent, under, or partial slashes, studies generally indicate that the circle slash variant is more preferred due to familiarity and concordance with Gestalt principles (Abdulla & Hubner, 2006; Murray et al., 1998). In this study, the circle slash symbol will be compared with the crossed slashes (  ) prohibition symbol. Although there have been no studies comparing comprehension rates, past studies have found that motivation to comply were equivalent (Freeman & Wogalter, 2002).

If there are no familiar representations available, then using concrete icons that may be encoded metaphorically may be effective. In this study, the concrete icons, badge (  ) and bandit (  ) were used to convey the message illegality. However, despite suggestions by researchers to utilize concrete icons whenever possible, users may not be able to successfully connect the intended meaning of the concrete icons when paired with other symbols within the icon. Furthermore, the level of detail or the size of the concrete icon may cause viewers from discerning the image resulting to misinterpretation. The concrete icons used to denote illegality were purposefully designed to be smaller than other components, because emphasis is placed on informing viewers of the prohibited actions. Consequently, this information should be delivered so that communication is immediate, using increased size as a mechanism for emphasis within the icon.

Other than using icons that are familiar and concrete, comprehension may also be enhanced through the use of context (Garcia et al., 1994; Silver et al., 1995; Wolff & Wogalter, 1998). In this study, some of the test icons will incorporate the image of a computer as a border of the components of the icon, reinforcing to users that uploading and downloading electronic files of music is illegal. Furthermore, the image of the computer may help in grouping all of the elements together for ease in interpretation. For instance, the addition of the computer may help the user in associating the illegal icons with the rest of the elements so that correct interpretation can be achieved.

*Hypothesis 1*: Those icons that contain prohibitive symbols (1-8, 13-20, 25-32, 37-44, 49-56, 61-68, 73) will be rated higher in comprehensibility than those that do not contain prohibitive symbols. Prohibitive symbols are regarded as familiar icons and explicitly conveys the meaning "do not" to viewers.

*Hypothesis 2:* Icons that contain action icons (1-3, 5-7, 9-11, 13-15, 17-9, 21-23, 25-27, 29-31, 33-35, 37-39, 41-43, 45-47, 49-51, 53-55, 57-59, 61-63, 65-67, 69-71) will be rated higher in understandability than those icons that do not contain action icons (4, 8, 12, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 74).

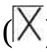
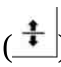
*Hypothesis 3:* Icons with the uploading symbol and the downloading symbol (1, 2, 5, 6, 9, 10, 13, 14, 17, 18, 21, 22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57, 58, 61, 62, 65, 66, 69, 70) will be rated higher in understandability than those icons that have the uploading/downloading combination symbol (3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71) due to familiarity.

*Hypothesis 4*: Icons that include a computer (1-36) as context will be higher in comprehension than those icons without a computer (37-74).

Hypothesis 5: Icons that do not contain prohibitive symbols but have a concrete symbol signifying illegality (9-12, 21-24, 45-48, 57-60, ) will be more comprehensible than those icons with no prohibitive symbol and no illegality symbol (24, 36, 48, 60, 72).

*Hypothesis 6*: Icons with prohibitive symbols that do not include the concrete symbols signifying illegal (25-36, 61-74) will be more comprehensible than those that contain illegal symbols (1-24, 37-60). This is predicted, because the illegal concrete symbols are not universally paired with prohibitive symbols and may cause confusion to viewers.

**Attention.** The selection of a theme to be portrayed visually, an image to express that theme, and stylistic details (borders, color, size) for added emphasis, are some of several approaches to influence attention. For instance, research found that noticeability increased when cigarette advertising included an octagon and a circle with an arrow pointing into it (Barlow & Wogalter, 1991; Meyers et al., 1981). Furthermore, graphically portraying consequences were found to heighten alertness in cigarette smoking warning messages (e.g., Hammond et al., 2011; 2012). Thus, using graphic pictorials of consequences may not only raise attention, but also perception of hazard (Otsubo, 1988). The images of a badge and a bandit will be predicted to increase salience, because they may potentially prompt users to remember that downloading and uploading copyrighted music is illegal.

However, these icons may be more noticeable, not only because of the consequences, but also because of the added complexity that these symbols may contribute to the icon overall. Complexity may be associated with either the level of intricate details or quantity of elements contained within an image (Ng & Chan, 2009). For instance, the picture of a badge (  ) may be viewed as less complex compared to the bandit (  ). According to Garcia et al. (1994), a higher level of detail corresponds to a concrete relationship between the icon and the referent. Their methodology, which involves counting various elements, including closed figures, vertical lines, horizontal lines and arrow arcs, would assign a score of 3 to the badge and a 5 to the bandit. Thus, if the proposed metric is found to be applicable to this study, subjects may find the bandit more attention getting than the badge leading to greater saliency. In addition, the use of crossed slashes () to denote prohibition may be found to be more noticeable, because it is not only less familiar but obscures a section of the icon resulting to increased conspicuity. Alternatively, complexity of an icon composed of many symbols may also be associated with the amount of information that is portrayed within each icon (e.g., McDougall, Tyrer, & Folkard, 2006). In this respect, the symbol combining the upload/download actions () may be considered more complex than the symbols depicting each of those actions. Because complex icons may take longer to process than simpler icons, it may require longer glance time; thus, increasing attention to the symbol. In this study, the addition of a computer, action symbols, and illegality symbols may also add to the overall complexity of the icon, because of the amount of pieces of information presented (e.g., context, prohibition, action, illegality). The more elements contained within an icon may consequently lead to stronger conspicuity than icons containing less elements.

*Hypothesis 7:* The more symbols an icon has, the greater the noticeability ratings. The number of symbols contained within each icon ranges from 1 to 4.

*Hypothesis 8*: Icons that contain illegal symbols (1-24, 37-60) will be rated higher in salience than the control group (25-36, 61-72*)*.

*Hypothesis 9*: More specifically, icons that contain an image of a bandit (13-24, 49-60) may be more salient than those that contain an image of a badge (1-12, 37-48) and the control group (25-36, 61-72), due to their differing complexity levels as measured by the metric developed by Garcia et al. (1994).

*Hypothesis 10*: Icons that include the computer for context (1-36) will be rated higher in salience than those icons that do not include the image of a computer (37-72).

*Hypothesis 11*: Icons that prohibitive symbols (1-8, 13-20, 25-32, 37-44, 49-57, 61-68, 73) will be rated higher in salience than those without (9-12, 21-24, 33-36, 45-48, 58-60, 69-72).

*Hypothesis 12*: Icons that contain the two crossed slashes (5-8, 17-20, 29-32, 41-44, 53-57, 65-68) will be rated higher in salience than those with the circle slash (1-4, 13-16, 25-28, 37-40, 49-52, 61-64, 73).

*Hypothesis 13*: Icons that contain actions (1-3, 5-7, 9-11, 13-15, 17-19, 21-23, 25-27, 29-31, 33-35, 37-39, 41-43, 45-47, 49-51, 53-55, 57-59, 61-63, 65-67, 69-71) will be rated higher in attention getting than icons that do not contain action icons (4, 8, 12, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 74).

*Hypothesis 14*: Icons that contain the upload/download combination symbol (3, 7, 11, 15, 19, 23, 27, 31, 35, 39, 43, 47, 51, 55, 59, 63, 67, 71) will be rated higher in attention getting than icons that contain the symbol for upload and the symbol for download (1, 2, 5, 6, 9, 10, 13, 14, 17, 18, 21, 22, 25, 26, 29, 30, 33, 34, 37, 38, 41, 42, 45, 46, 49, 50, 53, 54, 57, 58, 61, 62, 65, 66, 69, 70).

**Carefulness/ likelihood of compliance.** Aside from external factors such as characteristics of the icon itself, location of the warning icon, and timing of presentation, internal factors such as attitudes, beliefs, and previous experience of viewer may affect compliance. Although standardized symbols may enhance interpretability, constant exposure to familiar warning stimuli, however, may lead users to dismiss the icons and refrain from compliance due to habituation effects (e.g., Amer & Maris, 2007). Therefore, increased gaze time and perception of hazardousness may be roused by the complexity or unfamiliarity of a symbol (McCafferty, 1999). In this study, the use of symbols to denote illegality, badge, and bandit, is expected to be contribute to distinctiveness to test icons, because they require more cognitive effort to discern the meaning.

Accordingly, factors that influence attention may overlap with carefulness and compliance. When information and consequences are explicit, carefulness and compliance tend to increase. For instance, subjects rated prohibitive symbols combined with incorrect positions in Carpal Tunnel Syndrome warnings as more effective in terms of achieving compliance than warnings consisting of correct positions with no prohibitive symbols (Freeman & Wogalter, 2002). However, when comparing the circle slash symbol with the crossed slashes, there were no differences found in terms of motivation to comply. Thus, explicitness may be increased through the use of prohibition symbols in addition to visual information with regards to specific behaviors or actions that should be avoided. Moreover, because it is expected that carefulness and likelihood of compliance will be highly correlated, the hypotheses for these two dependent variables will be the same.

*Hypothesis 15*: Icons that contain illegal symbols (1-24, 37-60) will be rated higher in carefulness than those without illegal (25-36, 61-72*)*.

*Hypothesis 15a:* Icons that contain illegal symbols (1-24, 37-60) will be rated higher in likelihood of compliance than those without illegal (25-36, 61-72*)*.

*Hypothesis 16*: Icons that contain the badge (1-12, 37-48) will be rated higher in carefulness than the bandit (13-24, 49-60), because of complexity and the closer association with the concept of “illegal”.

*Hypothesis 16a:* Icons that contain the badge (1-12, 37-48) will be rated higher in carefulness than the bandit (13-24, 49-60), because of complexity and the closer association with the concept of “illegal”.

*Hypothesis 18*: Icons that contain action icons (1-3, 5-7, 9-11, 13-15, 17-19, 21-23, 25-27, 29-31, 33-35, 37-39, 41-43, 45-47, 49-51, 53-55, 57-59, 61-63, 65-67, 69-71) will be rated higher in carefulness than icons that do not contain action icons (4, 8, 12, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 74).

*Hypothesis 18a*: Icons that contain action icons (1-3, 5-7, 9-11, 13-15, 17-19, 21-23, 25-27, 29-31, 33-35, 37-39, 41-43, 45-47, 49-51, 53-55, 57-59, 61-63, 65-67, 69-71) will be rated higher in carefulness than icons that do not contain action icons (4, 8, 12, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 74).

**Research Goal**

The goal of this exploratory investigation was to devise a combination of visual elements in an icon that instructs viewers not to steal music. The target message of the icons developed for this research study was “Do not illegally upload and/ or download music.” This study posited that using a combination of characteristics conveying these various elements to Internet users would effectively communicate the hazardousness of this common behavior, regardless of level of computer expertise. In this study, the independent variables represented context (computer, control), illegal (badge, bandit, control), prohibitive (encircled slash, two crossed slashes, control) and actions (download, upload, upload/download, control). The dependent variables were understandability, carefulness, likelihood of compliance, and attention-getting.

## Study 1

### Participants

A total of 138 surveys were obtained from students in fulfillment of partial credit for their General Psychology course at the University of Nevada, Las Vegas. The sample comprised of 45.7% males (n =63) and 54.3% females (n=75) predominantly ranging from 18 to 24 years old (94.4%; M = 20.18, SD = 3.997). The ethnicity composition consisted of 29.7% Caucasian (n=41), 7.2% African American (n=10), 19.6% Hispanic (n=27), 33.3% Asian (n=46), .7% American Indian/Alaskan Native (n=1), 4.3% Native Hawaiian/ Pacific Islander (n=6), and 5.1% Other (n=7). The majority of the sample were full time students 92.8% (n=128) with 49.3% freshmen (n=68), 25.4% sophomores (n=35), 14.5% juniors (n=20), and 10.9% seniors (n=15). Approximately 74.6% (n=103) indicated that English was their primary language and one respondent did not answer. With regards to using peer to peer networks, 41.3% (n=57) reported using them and 58.0% (n=80) reported not using them. Only 13% (n=18) reported that they uploaded music on the Internet; whereas 71% (n=98) of respondents reported that they downloaded music on the Internet. Only 68.1% (n=94) believed that uploading music was illegal. About the same amount of respondents believed that downloading copyrighted music was illegal, 67.4% (n=93). In terms of moral acceptance, 48.6% of participants indicated neither agreed nor disagreed (n=67), 29% (n=40) agreed, and 7.2% (n=10) strongly agreed with the statement. For the moral acceptability of downloading, 44.9% (n=62) neither disagreed nor agreed with the statement, 29.0% (n=40) agreed, and 13.0% (n=18) strongly agreed with the statement.

**Research Design**

A variety of pictorial designs generated by the combination of symbols, each representing different concepts within the target message, were tested. A 2 (context: computer, control) x 3 (illegality: badge, bandit, control) x 3 (prohibition: prohibitive symbol or diagonal slash, two crossed slashes, control) x 4 (actions: uploading, downloading, uploading/downloading, control) within-subjects design was used. Accordingly, 72 different combinations of symbols to convey "Do not illegally upload/ download music" (See Appendix B) were tested.

Potential icons were identified by conducting a web search of images that represented each of the concepts described in the target message. Individual images were selected by the researcher and an undergraduate student who had a strong background in graphic design. The criteria for inclusion were based on familiarity, legibility, and simplicity. All of the icons used in this study were developed by the combination of recreated symbols using a graphic design software program (Adobe Photoshop CC 2014) and were created at 72 pixels per inch. None of the icons used in this experiment were under copyright protection. In addition to the testing of all possible combinations of the symbols, two exploratory icons were included that did not include the representational strategy paradigm: a picture of an ipod with an eye () and a copy icon with an eighth note and a prohibition symbol (). Therefore, a total of 74 test icons were used in this study.

Participants rated the understandability of the icon, salience (i.e., attention) of the icon, the level of carefulness necessary, and the likelihood of compliance to the graphic representation. Each of these measures used a 9-point scale ranging from "Not at all" (1) to "Extremely" (9). An additional set of open-ended questions required respondents to explain the meaning of each of the displayed icons. This set of open-ended questions was presented first across all respondents and represents the variable, "interpretability". Another question set involved assigning representativeness ratings of each of the presented icons to the target message ("Do not pirate music"), which was presented last for all participants (See Appendices C and D) to prevent respondents from knowing the target message while they were answering the other questions. Participants responded to the same question set for each icon before the next question was presented to minimize carry-over effects. Thus, in addition to icon presentation order, the order of presented questions sets was randomized with exception to those representing interpretability, which was completed first, and those for representativeness, which was completed last.

Because of the strong similarities among the test pictorials, participants were considered susceptible to test fatigue and other potential carry over effects when rating each of the stimuli. To further minimize carry over, 16 distractor icons were presented to participants along with the test icons. The distractor items included icons that contained a picture of a computer and both types of prohibitive symbols that were shown to the test groups (See Appendix E). Thus, a total of 90 icons, subdivided into blocks of 3 consisting of 30 icons each, were randomly presented to participants. Rest periods lasting 30 seconds each between blocks were implemented.

**Procedure**

The entire study was administered through an online survey application, Qualtrics, to UNLV students. Therefore, the study was accessible through any laptop or computer. After agreeing to the consent form, the participants were presented with the following instructions:

> *"You will be seeing a series of icons one at a time. You will be asked to rate each icon on features such as, understandability, attention-getting, and likelihood of compliance.*

*In addition, you will be asked to describe the meaning of the icon. After the presentation of several icons, there will be a 30 second rest period. There will be a total of 3 rest periods throughout the experiment. An online questionnaire requesting for basic demographic information, such as sex, age, and class year, will immediately follow. In addition, attitudes and behaviors specific to the study's main focus will be presented."*

The study took approximately 90 minutes to complete, based on a median split analysis (MD=76.2 minutes).

# Results

## Data preparation

To prepare the data for analysis, the collected scores were scanned for outliers by using a cutoff *z* score of 3.29 ($p < .001$). Based upon this criterion, no scores were excluded prior to analyzing the data.

As shown in Table 1, other than interpretability scores, the correlations among the remaining dependent variables were statistically significant with coefficients ranging from .332 to .629. Results revealed strong relationships among perceived representativeness as well as views on understandability, carefulness, attention, and compliance. The lowest coefficient was between *attention* and *representativeness* ($r = .332$); whereas, the highest was between *compliance* and *attention* ($r = .629$). The ability of the pictorial to convey the correct meaning (*interpretability*) was observed to only slightly influence *understandability* ratings, as exhibited by the small, yet statistically significant correlation ($r = .257$). The mean *interpretability* accuracy rate for all tested icons was notably low at 32%.

## Multivariate Analysis of Variance

Before conducting a multivariate analysis of variance (MANOVA), assumptions including homogeneity of variance, linearity, and normality were checked. Correlations were examined across the dependent variables for determining collinearity or potential multicollinearity. According to the correlational analysis, as shown in Table 1, multicollinearity existed for *understandability*, *careful*, *attention*, *compliance*, and *representativeness*. However, because specific hypotheses were postulated for these variables, each variable was treated separately rather than as an aggregate. Homogeneity of variance was checked with the Levene's test for means, revealing that the majority of the dependent variables supported the null hypothesis that the variance was equal across groups being tested ($p > .05$). Furthermore, normality was checked by scanning the q-q plots. Kurtosis and skewness values were significantly different from 0. Although the assumptions were not met by some of the dependent variables, control of Type 1 error rate would be enhanced by the MANOVA without losing much power given that a repeated measures analysis was conducted on a relatively large sample size.

A 2 (sex) x 2 (context – computer v no computer) x 3 (illegality – control, badge, bandit) x 3 (prohibitive – control, slash, X) x 4 (actions – control, down, up, download/upload) mixed-model (1-between, 4-within) MANOVA was computed with *understandability*, salience (*attention*), *carefulness*, likelihood of *compliance*, *representativeness*, and interpretability as the dependent variables. As shown in Table 2, there were statistically significant differences between sexes, Wilks's $\lambda = .892$, $F(6, 131) = 2.634$, $p < .02$, partial $\eta^2 = .108$, observed power = .845; and contexts, Wilks's $\lambda = .667$, $F(6, 131) = 10.896$, $p < .001$, partial $\eta^2 = .333$, observed power = 1.00. Likewise, statistically significant differences were found among illegalities, Wilks's $\lambda = .258$, F(12, 125) = 29.991, $p < .001$, partial $\eta^2 = .742$, observed power = 1.00; prohibitive, Wilks's $\lambda = .173$, F(12, 125) = 62.37), $p < .001$, partial $\eta^2 = .834$, observed power = 1.00; and actions, Wilks's $\lambda = .160$, F(18, 119) = 34.817, $p < .001$, partial η2 = .840, observed power = 1.00. Although there were a number of statistically significant two-way interactions (context x illegality; context x prohibitive, illegality x prohibitive, context x actions, illegality x actions, prohibitive x actions) and three-way interactions (context x illegality x action, context x prohibitive x actions, illegality x prohibitive x actions), a statistically significant context x illegality x prohibitive x actions four-way interaction was observed, Wilks's $\lambda = .313$, $F(72, 65) = 1.983$, $p < .004$, partial $\eta^2 = .687$, observed power = 1.00.

**Factorial Analyses of Variance**

Following the omnibus MANOVA, subsequent 2 (sex) x 2 (context) x 3 (illegality) x 3 (prohibitive) x 4 (action) mixed-model (1-between, 4-within) analyses of variance (ANOVA) were performed with understandability, salience, carefulness, likelihood of compliance, representativeness, and interpretability serving as the dependent variables (see Table 2).

For each ANOVA, sphericity was examined via the Mauchly test for repeated measures with more than two levels to determine if degrees of freedom adjustments, such as Greenhouse-Geisser or the Huynh-Feldt corrections were needed. If the Mauchly test was statistically significant and if the epsilon value was less than .75, then the Greenhouse-Geisser adjustment was used. However, if the epsilon was greater than .75, then the Huynh-Feldt probability level was used (Field, 2013).

Main and interaction effects were considered statistically significant, if they did not exceed the Bonferroni correction $p$ level of .00833 (.05/6) and $p$ level of .001667 (.01/6) to lower the Type 1 error rate. After identifying statistically significant main effects, Fisher-Hayter range tests were conducted to determine the differences among all pairwise mean comparisons (with more than two levels). However, because this study primarily dealt with interpretability, only that variable will be examined with regard to the largest order interaction. The interaction was plotted and subsequent tests of simple effects followed by Fisher-Hayter range tests for that particular simple effect were performed.

**Comprehension.** Comprehension was examined by means of two question formats: open ended (*Interpretability*) and self-ratings (*Understandability*). Interpretability scores were obtained by coding respondents' online answers to the question: "What does this icon mean to you?" Statements such as, *no downloading*, *no uploading*, *no music piracy*, *piracy is illegal*, were coded with the value '1', because they indicated that the respondents associated the icon with the intended message. However, other statements in which comprehension was not as evident, including those, such as *no music* or *illegal music*, were coded with a '0'. *Understandability* was assessed by having respondents rate the icon from 1 (not at all understandable) to 9 (extremely understandable). Table 1 shows that among all the dimensions, interpretability accuracy ratings only significantly correlated with *understandability* ($r$ = .257). *Understandability* ratings had the strongest correlation with *attention* ($r$ = .629) and weakest correlation with representativeness ($r$ = .398). Statistically significant ANOVA results for interpretability are presented in Table 3, whereas the results for *understandability* are given in Table 4.

***Do prohibitive symbols increase comprehension (Hypothesis 1)?*** As shown in Table 3, there were statistically significant differences among prohibitive symbols in *interpretability* (Mauchly's $W$=.290, $p < .001$, $\varepsilon = .585$), $F(1.169, 159.027) = 217.377$, $p < .01$. Fisher-Hayter tests indicated that the icons with a *slash* (M =.491, SD = .305) and the *cross* (M = .475, SD = .305) were interpreted more correctly as a warning against music piracy than the *control* (M = .193, SD = .188), $p$s<.0001. As illustrated in Table 4, there were also statistically significant differences among prohibitive symbols in *understandability* (Mauchly's $W$ = .637, $p < .001$, $\varepsilon$ = .734), $F(1.467, 199.520) = 9.477$, $p < .05$. Subsequent Fisher-Hayter tests indicated that the slash (M = 4.753, SD = 1.66) was rated significantly more understandable than the control (M = 4.504, SD = 1.515), $p < .001$, and the cross (M = 4.542, SE = .139), $p < .004$. Thus, Hypothesis 1 was mostly supported for comprehension through *interpretability* (open ended questions) than *understandability* scores.

***Does the addition of action icons increase comprehension (Hypothesis 2 and 3)?*** There were statistically significant differences among action icons with regards to *interpretability*, (Mauchly's $W = .357$, $p < .001$, $\varepsilon = .589$), $F(1.767, 240.287) = 210.102$, $p < .01$. Fisher-Hayter tests revealed that icons containing the *download symbol* (M = .505, SD = .305, $p < .0004$), the *upload* (M = .496, SD = .317, $p < .0005$), and the *download/upload* symbol (M = .435, SD = .317 $p < .005$) were each statistically significantly greater in *interpretability* than icons without action symbols (M = .108, SD = .117). Furthermore, the *download/upload* symbol resulted in significantly less accurate *interpretations* than both the *download* ($p < .02$) and the *upload* ($p < .03$) symbols.

*Understandability* ratings were also significantly different among action icons (Mauchly's $W$=.228, $p < .001$, $\varepsilon = .570$), [$F(1.710, 232.497) = 56.628$, $p <.01$]: *control* (M = 5.42, SD = 1.539), *download* (M = 4.588, SD = 1.809), *upload* (M = 4.327, SD = 1.774), and *download/upload* (M = 4.060, SD = 1.809). Interestingly, participants indicated that they understood icons without action symbols better than those with *download*, *upload*, and *download/upload* with *p*s < .0001. Although the *download* symbol received significantly greater *understandability* ratings than the *download/upload* symbol ($p < .002$), there were no other statistically significant differences between all other pairwise combinations.

Therefore, the prediction (Hypothesis 2) that icons with action symbols will be higher in comprehension than those without action symbols was only supported with the open-ended responses (i.e. *interpretability*), but not with the ratings of *understandability*. Nevertheless, Hypothesis 3 was partially supported by results indicating that the *download* symbol, but not the *upload* symbol, improved understandability over the *download/upload* symbol.

***Does the addition of context increase comprehension (Hypothesis 4)?*** *Interpretability* of icons with a *computer* (M = .404, SD = .2584) was significantly higher than with *no computer* (M = .368, SD = .2467), $F(1, 136) = 29.296$, $p < .01$. However, there was no statistically significant difference in *understandability* between icons with (M = 4.580, SD = 1.586) and without *context* (M = 4.619, SD =1.527), $F(1, 136) = 1.452$, $p > .05$. Thus, Hypothesis 4 was only supported through *interpretability*, but not with *understandability* ratings.

***Does the addition of illegality symbols increase comprehension?*** There were no prior predictions regarding the differences in comprehension rates of illegality symbols, because previous studies examining the impact of illegality symbols were not found. Nevertheless, there was a statistically significant difference in *interpretability* among illegality symbols, Mauchly's $W = .831$, $p < .001$, $\varepsilon = .871$, [$F(1.743, 237.034) = 42.520$, $p < .001$]: *control* (M = .330, SD = .1997), *badge* (M = .369, SD=.2548), *bandit* (M = .460, SD = .3289). Subsequent Fisher-Hayter tests found that icons with the *bandit* ($p < .00001$) and the *badge* ($p < .02$) were significantly more interpretable than those with no illegality symbols. Moreover, the *bandit* had significantly more correct interpretations than the *badge* ($p < .00001$).

Likewise, there was a statistically significant difference in *understandability* among illegality symbols, Mauchly's $W = .839$, $p < .001$, $\varepsilon = .878$, $F(1.756, 238.794) = 125.214$, $p < .01$. Subsequent Fisher-Hayter tests indicated that images without the illegality symbols (i.e. control group) (M =5.412, SD=1.7034) were significantly more *understandable* than both the *bandit* (M=4.000, SD= 1.6446) and the *badge* (M=4.386, SD = 1.656), with *p*s < .00001. Furthermore, the *badge* was rated significantly more understandable than the *bandit*, $p < .00011$.

***Do illegality symbols increase comprehension when there are no prohibitive symbols in the icons (Hypothesis 5)?*** There was a statistically significant illegality x prohibitive icons interaction (Mauchly's $W = .346$, $p < .001$, $\varepsilon = .699$), $F(2.795, 380.144) = 76.690$, $p < .001$ for *interpretability*. A subsequent simple effects tests for illegality at no prohibitive symbols was statistically significant, $F(2, 380.144) = 165.923$, $p < .001$. When there were no prohibitive symbols, Fisher-Hayter analyses revealed that the *bandit* (M = .370, SD = .3642, $p < .00001$) and *badge* (M = .202, SD = .2702, $p < .00001$) each significantly improved *interpretability* when compared to the control (M = .006, SD = .0235). Furthermore, icons with the *bandit* were significantly more likely to be interpreted accurately than those with the *badge*, $p < .00001$.

A statistically significant illegality x prohibitive icons interaction was also obtained for *understandability* ratings under symbols that had no prohibitive symbol (Mauchly's $W = 3.16$, $p < .001$, $\varepsilon = .655$, $F(2.548, 346.511) = 21.626$, $p < .001$). Subsequent to finding statistically significant results for simple effects, $F(2, 346.511) = 203.723$, $p < .001$, the control was significantly rated higher in *understandability* (M = 5.621, SD = 1.7269) than both the *badge* (M = 4.034, SD = 1.6564) and the *bandit* (M = 3.858, SD = 1.6799), with *p*s < .00001. Yet, the *badge* was rated significantly higher in *understandability* than the *bandit*, $p < .002$. These findings replicate the diverging pattern with respect to what is perceptually understood by respondents versus what is actually understood as measured by the open-ended questions. These results are also in agreement with those associated with main effects.

Thus, Hypothesis 5 was supported by interpretation accuracy obtained through answers to open-ended questions, but not by self-ratings of *understandability*.

***Do illegality symbols decrease comprehension when there are prohibitive symbols in the icons (Hypothesis 6)?*** Subsequent to the statistically significant interaction between illegality and prohibitive via a univariate ANOVA, tests of simple effects, ($F(2, 380.144)=1.722$, $p > .05$), indicated that there were no statistically significant differences in *interpretability* among illegality symbols when the prohibitive sign was a *slash*: control (M=.493, SD = .305), badge (M=.472, SD = .317), and bandit (M=.509, SD = .329).

However, the test of simple effects found statistically significant differences for illegality symbols for the *cross*, $F(2, 380.144) = 6.951$, $p < .05$. Both the *bandit* (M = .501, SD = .3642) and control (M = .491, SD = .3054) were found to be significantly more interpretable than the *badge (*M =.432, SD = .3054), with $p < .0007$ and $p < .004$, respectively. However, the *bandit* and control were not significantly different from each other. Thus, in terms of interpretability, the use of the *bandit* did not facilitate accuracy over the control when they were paired with the *cross*. Rather, icons with the *badge* received more incorrect interpretations than the control.

It was predicted that concrete symbols would result to lower comprehension when paired with a prohibitive symbol. According to *interpretability* results, this was not the case for *slash*, because there were no significant differences among controls and illegality symbols. However, for *cross*, the *bandit*, but not the *badge*, performed as well as the control. Thus, Hypothesis 6 was not supported, based on interpretation accuracy.

For ratings of *understandability*, simple effects tests found statistically significant differences for illegality symbols under the *slash*, [$F(2, 346.511) = 101.606$, $p < .001$], and *cross* [$F(2, 346.511) = 67.741$, $p < .001$]. For icons with the *slash*, both the *badge* (M = 4.660, SD = 1.8208) and the *bandit* (M = 4.119, SD = 1.7621) led to significantly lower *understandability* ratings than the control group (M = 5.481, SD = 1.8208), with *p*s $< .00001$. However, the *badge* was rated significantly higher in *understandability* than the *bandit* ($p < .00001$).

A similar pattern emerged under the *cross*. The control group (M = 5.136, SD = 1.7856) was rated significantly higher in *understandability* compared with both the *badge* (M = 4.465, SD = 1.9031, $p < .00001$) and the *bandit* (M = 4.024, SD = 1.7621, $p < .00001$). Furthermore, the *badge* was rated significantly higher in understandability than the *bandit* ($p < .00002$). In contrast to *interpretation* results, *understandability* results better supported Hypothesis 6, because subjects viewed the icons as less understandable when both illegality and prohibitive symbols were paired together.

The use of illegality symbols generally did not affect interpretation accuracy when paired with prohibitive symbols. The pairing between *cross* and the *bandit*, however, led to more improved accuracy than between the *cross* and the *badge*. Nevertheless, these symbols, especially the *bandit*, were found to increase interpretability when there were no prohibitive symbols.

Overall, the results revealed that the addition of context, prohibitive, action, and illegality symbols generally facilitate interpretability. More specifically, the addition of all the tested action and prohibition symbols, along with an encapsulating computer image, led to an increase in interpretation rates over the control group. However, the addition of illegality symbols mainly improved interpretability when there were no prohibitive symbols.

**Attention.** As shown in Table 1., *attention* ratings had the highest correlation with *compliance* ($r = .629$) and *understandability* ($r = .541$). Lowest correlation was found with *representativeness* ratings ($r = .332$).

***Do attention ratings increase as the number of symbols in an icon increase (Hypothesis 7)?*** A separate one-way repeated measures ANOVA was performed on test items composed of the *eighth note* with the quantity of extra symbols ranging from 0 (no added symbols) to 4 (containing 4 added symbols) serving as the independent variable. *Attention* ratings was the dependent variable. Icons that were classified under four added symbols indicated that the icon was comprised of one symbol representing each of the four tested categories: context, action, prohibitive, and illegality. There were statistically significant differences among these icons on *attention* ratings (Mauchly's W = .002, $p < .001$, $\varepsilon = .318$), $F(1.271, 174.113) = 17.149$, $p < .001$, partial $\eta^2 = .111$, observed power = .995. Subsequent Fisher-Hayter tests revealed that icons containing all four types of symbols (M = 5.075, SD = 1.891) received significantly higher *attention* ratings than those with no (M = 3.928, SD = 2.550), $p < .001$ or one added symbol (M = 3.967, SD = 1.492), $p < .002$. There were no statistically significant differences for all other pairwise comparisons, which included grouped icons with two (M = 4.343, SE = 1.386) and three added symbols (M = 4.699, SE = 1.586).

Thus, marked differences in *attention* ratings were only observed between icons containing zero or one added symbol and those containing all four added symbols to the *eighth note*. This suggests that the differences between number of symbols within an icon must be at least three or more to result in increased *attention* ratings. Nevertheless, *attention* ratings improved as the number of symbols increased as predicted in Hypothesis 7. Yet, it is noted that aside from quantity, quality of symbols may have an impact on attention-getting ratings.

***Does the addition of illegality icons increase attention (Hypothesis 8 and 9)?*** The repeated-measures ANOVA, as shown in Table 5, indicated that there were statistically significant differences among the illegality icons on *attention*, (Mauchly's $W = .435$, $p < .001$, $\varepsilon = .649$) $F(1.704, 231.811) = 20.455$, $p < .001$: *control* (M = 4.307, SD = 1.3979 ), *badge* (M = 4.904, SD = 1.7386), *bandit* (M = 4.495, SD = 1.5859). Subsequent Fisher-Hayter tests found that the *badge attention* ratings were significantly greater than the control, $p < .00001$, and the *bandit*, $p <.0002$. However, the control and the *bandit* were equivalent in terms of *attention* ratings ($p >.05$). Thus, in terms of *attention*, the *badge* performed the best. The *bandit* did not increase *attention* over the control group. It was predicted that illegality symbols will be stronger in salience than the control group (Hypothesis 8), with the bandit being more salient than both the badge and the control (Hypothesis 9). Thus, Hypothesis 8 was partially supported by the results, whereas Hypothesis 9 was unsupported.

***Does the addition of context increase attention (Hypothesis 10)?*** The *attention* ratings for *context* (M = 4.678, SD = 1.5389) were significantly higher than those without context (M = 4.460, SD = 1.4332), $F(1, 136) = 14.215$, $p < .001$. The prediction that including a computer in the icons would increase salience (Hypothesis 10) was supported.

***Does the addition of prohibitive symbols increase attention (Hypothesis 11 and 12)?*** Statistically significant differences were found among prohibitive symbols with regards to *attention*, (Mauchly's $W = .563$, $p < .001$, $\varepsilon = .696$), $F(1.392, 189.244) = 73.111$, $p < .001$. Subsequent Fisher-Hayter tests found that the *slash* (M = 5.006, SD = 1.6329) had significantly greater *attention* ratings than the *cross* (M = 4.671, SE = 1.574, $p < .0008$) and the control (M = 4.029, SD = 1.4214, $p < .00001$). The *cross* also had significantly greater *attention* ratings than the control, $p < .00001$. Therefore, Hypothesis 11 was supported, because both prohibitive symbols had higher *attention* ratings than the control. However, in opposition of Hypothesis 12, the *cross* received lower ratings than the *slash*.

***Does the addition of action icons increase salience (Hypothesis 13 and 14)?*** There were no statistically significant differences among icons that contained the *download* symbol (M = 4.637, SD = 1.5741), the *upload* symbol (M = 4.543, SD = 1.5154), the *download/upload symbol* (M = 4.494, SD= 1.5154) and the control group (M = 4.602, SD = 1.4919) in terms of *attention-getting* ratings (Mauchly's $W = .435$, $p < .001$, $\varepsilon = .649$), $F(1.946, 264.592) = 1.727$, $p > .05$. Therefore, Hypotheses 13 and 14 were both unsupported.

**Carefulness and Compliance.** The correlational coefficient for *carefulness* was highest with *compliance* ratings (.521) and lowest with *representativeness* (.401). For *compliance*, the correlation coefficient was highest with *attention* ratings (.629) and lowest with *representativeness* (.423).

***Does the addition of illegality symbols increase carefulness and compliance (Hypothesis 15, 15a, 16, 16a)?*** As illustrated in Table 6, there was a statistically significant difference among the illegality icons on *carefulness*, (Mauchly's $W = .990$, $p > .05$), [$F(2, 272) = 55.740$, $p < .001$]: *badge* (M = 4.86, SD = 1.8913), *bandit* (M = 4.51, SD = 1.8208), *control* (M = 3.58, SD = 1.3744). Post hoc Fisher-Hayter analyses found that the *badge* and the *bandit* had significantly higher *carefulness* ratings than the control ($p$s < 0.0001). In addition, the *badge* was rated significantly higher in *carefulness* than the *bandit*, $p < .007$, thereby supporting Hypothesis 16. Furthermore, the prediction that illegality icons would increase carefulness was supported (Hypothesis 15).

In a separate repeated measures ANOVA found in Table 7, statistically significant differences among illegality symbols were also found for *compliance* ratings (Mauchly's $W = .942$, $p < .05$, $\varepsilon = .965$), $F(1.930, 262.416) = 14.352$, $p < .001$. Fisher-Hayter range tests indicated that the *badge* (M = 4.727, SD = 1.871) was rated significantly higher in compliance compared with the *bandit* (M = 4.185, SD = 1.7151, $p < .00001$), but not the control (M = 4.562, SD = 1.6094, $p > .05$). Furthermore, the control was significantly higher in *compliance* ratings than the *bandit*, $p < .0005$. Thus, the prediction that illegality symbols would raise *compliance* ratings (Hypothesis 15a) was not supported. However, the prediction that the badge would be rated higher in *compliance* (Hypothesis 16a) was supported by the results.

Slightly lower compliance perception scores given to images without illegality symbols may be indicative of the potentially stronger influences of outside variables, such as personality traits, beliefs, or attitudes, and warrants further investigation, which may explain why the prediction was unsupported. Alternatively, the *badge* may increase compliance perceptions, because it conveys the concept of authority and law enforcement, serving as a reminder of potential legal consequences. In this respect, the reminder of legal consequences through a visual display may illicit more compliance than a *bandit*, which connotes stealing. In addition, respondents may feel more antagonized by the *bandit*, which may carry repercussions of non-compliance.

***Does the addition of action icons increase carefulness and compliance (Hypothesis 17 and 17a)?***

*Carefulness.* As indicated in Table 6, there were statistically significant differences among action icons with regard to carefulness ratings, (Mauchly's $W = .157$, $p < .001$, $\varepsilon = .472$), $F(1.415, 192.466) = 10.315$, $p < .001$. Fisher-Hayter range tests indicated that images without action icons (M = 4.102, SD = 1.4567) were rated significantly less in *carefulness* than *download* (M = 4.455, SD = 1.5859, $p < .002$), *upload* (M = 4.333, SD = 1.6094, $p < .05$), and the *download/upload* (M = 4.378, SD = 1.6094, $p < .02$). However, the *carefulness* ratings among all three action icons were not significantly different from each other. Thus, Hypothesis 17 was supported.

*Compliance*. Likewise, as shown in Table 7, there were statistically significant differences among action icons with regard to *compliance* ratings, Mauchly's $W = .244$. $p < .001$, $\varepsilon = .553$), $F(1.658, 225.489) = 11.247$, $p < .001$. The *control* (M = 4.787, SD = 1.6646) received significantly higher *compliance* scores than the *download/upload* (M = 4.269, SD = 1.7621, $p < .0003$) and the *upload* (M = 4.370, SD = 1.7386, $p < .004$), but not the *download* (M = 4.538, SD = 1.7738, $p > .05$). Although the ratings suggested that the addition of action icons would increase *carefulness* perceptions, such was not the case for *compliance*. Thus, the prediction that icons containing action would be rated higher in compliance than the control (Hypothesis 17a) was not supported.

***Does the addition of context increase carefulness and compliance?*** Although there were no apriori hypotheses concerning the effect of context on *carefulness* and *compliance*, the addition of context (M = 4.365, SD = 1.5272) increased *carefulness* as compared to no context (M = 4.269, SE = 1.4684), $F(1, 136) = 8.727$, $p < .05$) as indicated in Table 6. However, as shown in Table 7, there were no statistically significant results found for *compliance* in a separate ANOVA, $F(1, 136) = .591$, $p > .05$: no context (M = 4.505, SD = 1.5976) and context (M = 4.478, SD=1.6094).

***Does the addition of prohibition increase carefulness and compliance?*** As illustrated in Table 6, there was a statistically significant main effect of prohibition symbols for *carefulness*, (M = 3.390, SD = 1.4567), [Mauchly's $W = .391$, $p < .001$, $\varepsilon = .622$] $F(1.243,169.098)= 146.33$, $p < .01$. Subsequent Fisher-Hayter range tests revealed that the addition of the *slash* (M = 4.877, SD = 1.6916) and the *cross* (M = 4.683, SD = 1.6916) increased *carefulness* over the control, *p*s < .00001. However, there was no statistically significant difference between the *cross* and the *slash* ($p > .05$). In terms of *compliance*, as shown in Table 7, there were no statistically significant results obtained among prohibition symbols [Mauchly's $W = .290$, $p < .001$, $\varepsilon = .585$)], $F(1.170, 159.076) = 3.394$, $p > .05$: control (M = 4.665, SD = 1.7621), *slash* (M = 4.477, SD = 1.8561), *cross* (M = 4.331, SD = 1.8208).

**Representativeness.** Representativeness was measured last across all participants. Participants were asked: "How representative is this icon of the following definition: "Do not pirate music?" The same response yet for all other effectiveness dimension measurements was used. Though statistically significant, the correlation coefficients shared with other variables were lower. The highest coefficient was with *compliance* (.423) and the lowest was with *attention* (.332).

There were no a priori hypotheses posited for representativeness. Nevertheless, as indicated in Table 8, *context* significantly influenced *representativeness*, Mauchly's *W*, $F(1, 136) = 14.114$, $p < .001$. Icons with *computers* (M = 4.098, SD = 1.4332) were rated statistically greater in *representativeness* than those with *no computer* (M = 3.982, SD = 1.3979).

Moreover, there was a statistically significant effect of illegality [Mauchly's $W = .990$, $p > .05$] $F(2, 272) = 73.896$, $p < .001$. Fisher-Hayter range tests showed that the *badge* (M = 4.549, SD = 1.6799) was considered more *representative* than the *bandit* (M = 4.256, SD = 1.6799), $p < .006$ and the control (M = 3.314, SD = 1.3509), $p < .00001$. The *bandit* was also found to be more representative than the control ($p < .00001$).

Furthermore, there was a statistically significant main effect of *prohibition* [Mauchly's $W$= .256, $p$ < .001, ε = .573] $F$(1.147, 155.943) = 382.105, $p$ < .001. Subsequent Fisher-Hayter range tests revealed that the *slash* (M = 4.926, SD = 1.6211) and the *cross* (M = 4.619, SD =1.5389) were each rated significantly higher in *representativeness*, $p$s < .00001, as compared to the control (M = 2.574, SD = 1.4449). In addition, the *slash* was rated significantly higher in *representativeness* than the *cross* ($p$ < .02).

The main effect for *actions* was also statistically significant, [Mauchly's $W$ =.742, $p$ < .001, ε = .846], $F$(2.538, 345.204) = 70.959, $p$ < .001. The *download* (M = 4.417, SD = 1.4802), $p$ < .0001, *upload* (M = 3.991, SD = 1.5154), $p$ < .00001 and *download/upload symbol* (M = 4.314, SE = .131), $p$ < .00001 were rated significantly higher in *representativeness* than the control (M = 3.438, SD = 1.4684). Both the *download* ($p$ < .00001) and *download/upload* ($p$ < .0003) symbols had significantly higher ratings than the *upload.* Furthermore, there were no statistically significant differences between the *download* and the *download/upload* symbol in terms of *representativeness*.

**Context x Illegality x Prohibitive x Action Interaction.**

***Interpretability.*** In addition to testing the hypotheses, a statistically significant context x illegality x prohibitive x actions interaction was identified in open-ended questions for *interpretability*: [$F$(10.57, 1437.24) = 10.487, $p$ < .05, Mauchly's $W$ = .200, $p$ < .001, ε = .881]. The scores reflected the proportion of respondents that interpreted the icon accurately.

Due to limited findings within the warning literature regarding the efficacy of illegality icons, such as a *badge* and a *bandit*, determining measures on how these symbols can improve comprehension when combined with other features was examined. In addition to illegality symbols, stimuli were grouped in the interaction analysis to compare action icons, such as *download*, *upload*, and *download/upload*. The impacts of action icons on warning icons have not been explored in previous studies.

Although findings from this study revealed the comprehension and attention-getting advantages of including context (i.e. computer) into a music piracy warning, there may be practical limitations. These include legibility and space restrictions that may prevent the inclusion of a computer in the format displayed to the respondents (e.g. Laughery & Young, 1982). Furthermore, prohibition symbols may be excluded by some designers for a variety of reasons, such as for aesthetics. Current warnings for movie piracy use an FBI badge and an image of an official seal to remind viewers that the recorded content is covered under piracy laws, despite research findings that support the use of prohibition symbols, especially for intentional behavior (Leonard & Karnes, 2005). Therefore, to aid in guiding warning designers, the best combination of action and illegality icons under each level of prohibition (control, *slash*, *cross*) of context (no computer, computer) was explored.

***Action x illegality interaction as a function of computer and no prohibitive symbol.*** As illustrated in Figure 1, the simple effect of illegality and action was statistically significant for icons of *context*, with neither prohibition nor action symbols, $F(2, 1437.240) = 39.159$, $p < .001$. That is, in icons with no action symbols, no illegality symbols (M = .00, SD = .00) resulted in significantly less interpretational accuracy compared with the *badge* (M = .228, SD = .4229) and the *bandit* (M = .264, SD = .4464), *p*s < .00001. However, there were no statistically significant differences between the *badge* and the *bandit*, $p > .05$.

For *download* icons with no prohibition symbol, the test for simple effects found statistical significance among the control (M = .023, SD = .1527), the *badge* (M = .262, SD = .4464), and the *bandit* (M =.486, SD = .4934), $F(2, 1437.240) = 102.427$, $p < .001$. Subsequent Fisher-Hayter tests revealed that the *bandit* was significantly greater in interpretability than both the control and the *badge*, *p*s < .001. This pattern was consistent with results for both the *upload* and the *download/upload* symbols.

For *upload*, the simple effect test was statistically significant, $F(2, 1437.240) = 86.681$, $p < .001$. The control (M = .000, SD = .000) led to the least interpretational accuracy rate, followed by the *badge* (M = .212, SD = .4112), and the *bandit* (.426, SD = .4934), *p*s < .00001.

Under the *download/upload* symbol, $F(2, 1437.240) = 56.565$, $p < .001$, the *bandit* (M = .353, SD = .4816) once again outperformed icons containing the *badge* (M = .240, SD = .4112) and the control group (M = .015, SD = .1175). The Fisher-Hayter probability levels of the *bandit* compared to both the control group and the *badge* were $p < .001$ and $p < .0005$, respectively. The *badge* icons demonstrated better interpretability scores than the control, $p < .00001$.

Thus, as shown in Figure 1, when there is context (a computer icon) and no prohibitive symbol, the combination of the bandit with all levels of action symbols significantly surpassed the control and badge in *interpretability* rates.

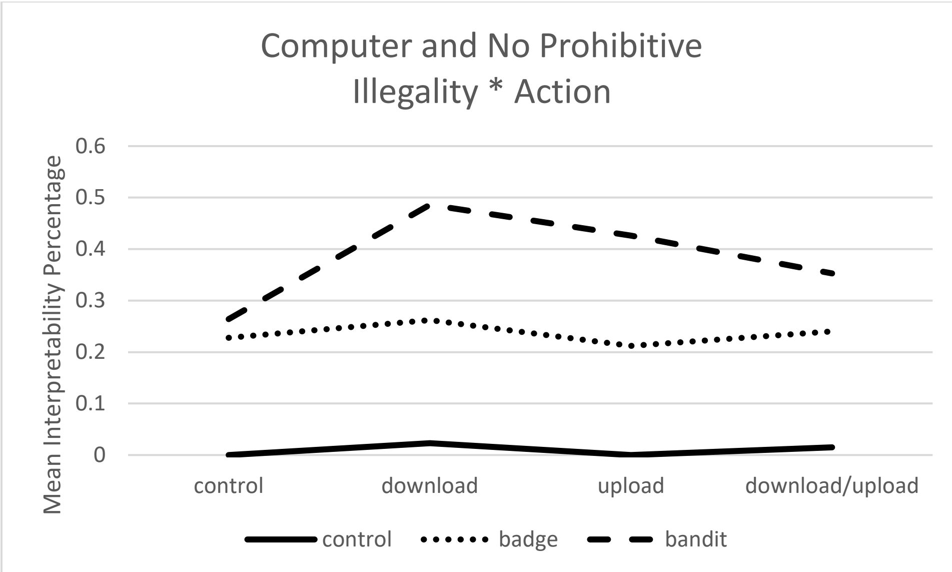



Figure 1. Mean interpretability percentage of icons as a function of context and no prohibitive symbols for each action and illegality symbols.

Although the interpretability ratings were lower, the same pattern highlighting the efficacy of the *bandit* and the *badge* over the control group emerged when there was no context across all action symbols. Furthermore, the *badge* was found to be significantly inferior to the *bandit* under all action symbols, but not for the control condition.

***The Action x Illegality Interaction as a Function of No Computer and No Prohibition Symbol.*** As shown in Figure 2, tests for simple effects found statistically significant differences among the control (M = .000, SD = .000), *badge* (M =.199, SD = .3994), and *bandit* (M =.246, SD = .4347), $F(2, 1437.240) = 32.583$, $p <.001$, when there was no action symbol. Subsequent Fisher-Hayter tests found that respondents interpreted *badge* and *bandit* icons significantly better than control (*p*s < .001). However, no statistically significant differences were found between the *badge* and the *bandit* ($p > .05$) when there was no action symbol.

Comparisons of the control (M = .000, SD = .000), *badge* (M = .007, SD = .0822), and *bandit* (M = .370, SD = .4934) groups also led to statistically significant differences under the *download* symbol, $F(2, 1437.240) = 85.567$, $p < .001$. According to the Fisher-Hayter tests, the *bandit* was interpreted significantly better than the control ($p < .001$) and the *badge* ($p < .01$). Interestingly, there was no statistically significant difference between the badge and the control when the *download* symbol was used ($p > .05$). Therefore, this suggests that the *badge* may be ineffective in increasing accuracy if the *download* symbol is included in an icon with no prohibitive symbols.

There were statistically significant simple effect differences among each of the illegal conditions under the *upload* and the *download/upload* symbols. For *upload*, $F(2, 1437.240) = 90.275$, $p < .001$, Fisher-Hayter tests indicated that both the *badge* (M = .239, SD = .4229) and *bandit* (M = .434, SD = .4934) were interpreted better than the control (M = .000, SD = .000), *p*s < .001. Likewise, simple effects testing also indicated statistically significant differences within the *download/upload* icons, $F(2, 1437.240) = 68.263$, $p < .001$, among the control (M = .008, SD = .0822), *badge* (M = .230, SD = .4229), and *bandit* (M = .384, SD = .4934) , in order of lowest to greatest *interpretability* rate, respectively. All pairwise comparisons were significantly different in *interpretability*, *p*s <.00001.

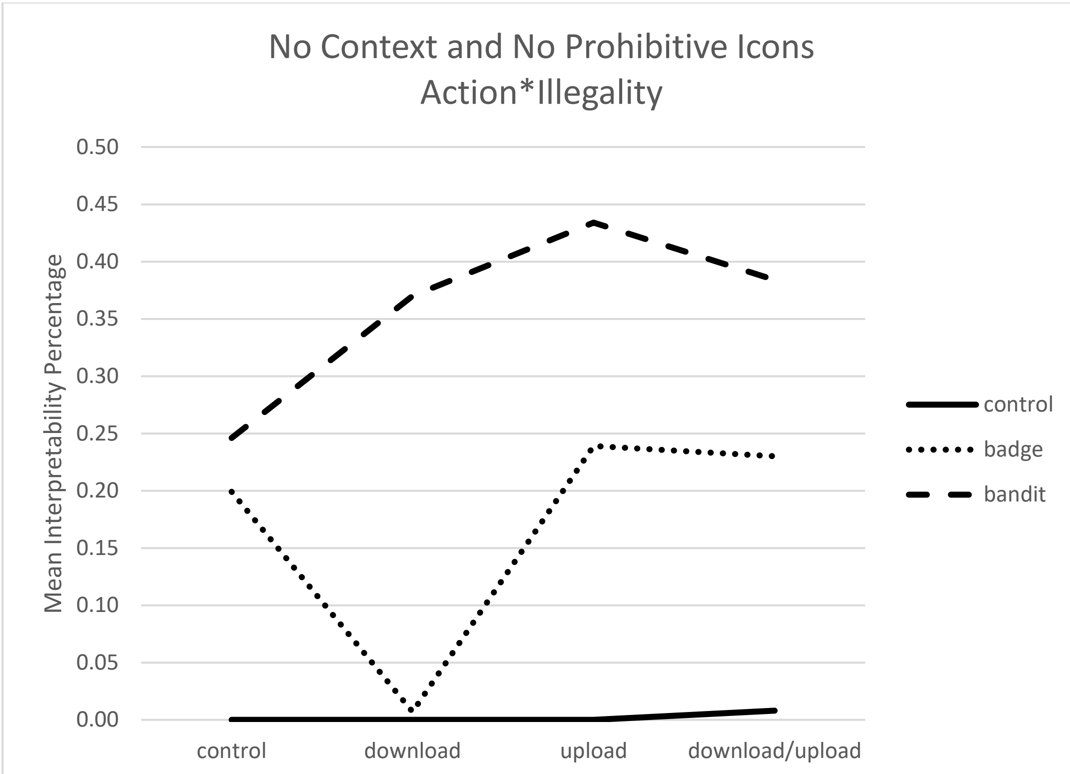



Figure 2. Mean Interpretability as a function of no context and no prohibitive icons for each action and illegality symbol.

***Action x Illegality Interaction as a Function of No Computer and Slash.*** As illustrated in Figures 3 and 5, when there was no action and a *slash* with *no computer* (i.e. only eighth note with a slash), simple effects tests revealed that there was no statistically significant difference in interpretability among control and experimental levels of illegality, $F(2, 1437.20) = .589$, $p > .05$: control (M = .000 SD = .000), *badge* (M = .035, SD = .1880), *bandit* (M = .015, SD = .1175).

Figure 3. Icons with no computer and no action symbols across illegality conditions from lowest to highest interpretability: control, badge, bandit.

Similarly, when the action was *upload*, ($F(2, 1437.240) = .874$, $p > .05$), there were no statistically significant differences among control (M = .648, SD = .4699), *badge* (M = .612, SD = .4816) or *bandit* (M = .650, SD = .4816). This was also the case for the *download/upload* symbol, ($F(2, 1437.240) = 1.957$, $p > .05$), in that the presence of illegality symbols did not influence *interpretability*: control (M = .616, SD = .4816), *badge* (M = .552, SE = .4934), *bandit* (M = .583, SE = .4816).

However, as shown in Figures 4 and 5, statistically significant differences among icons with three different prohibitive conditions were observed under the *download* symbol, $F(2, 1437.240) = 3.246$, $p < .05$. Fisher-Hayter tests revealed that the icon with no illegality symbol (control) (M = .701, SE = .038) scored significantly higher in *interpretability* than those with the *badge* (M = .624, SD = .041), $p < .009$, but not higher than the *bandit* (M = .688, SE = .040), $p > .05$. The *bandit* significantly scored significantly higher than the *badge*, $p < .05$. Although participants gave more correct interpretations to the controls, they appeared to have greater difficulty with the *badge* in comparison with the *bandit* symbol. This may be the case, because of the various meanings that a *badge* can connote. Other than law and order, the *badge* may be interpreted as meaning safe and secure.

Figure 4. Icons with no computer and download symbols across illegality conditions from lowest to highest interpretability: badge, bandit, control.

For each illegality symbol and control, the addition of action symbols consistently led to significantly greater *interpretability*. For symbols with no illegality signs, control (M = .000, SD = .000), *download* (M = .701, SD = .4464), *upload* (M = .648, SD = .4699), and *download/upload* (M = .616, SD = .4816) resulted in statistically significant differences, $F(3, 1437.24) = 207.267$, $p < .001$. *Download*, *upload,* and *download/upload* each were significantly greater in *interpretability* than the control based on Fisher-Hayter post hoc findings, $p < .00001$. Only the *download* symbol led to significantly greater *interpretability* than did *download/upload*, $p < .03$. There was no statistically significant difference between the *download* and *upload* symbols, $p > .05$. Thus, although all of the action symbols were better than the control, the *download* symbol led to the best *interpretability* rates.

For the *badge*, there were statistically significant differences among the levels of action icons in the test of simple effects [$F(3, 1437.240) = 152.219$, $p < .001$]: control (M = .035, SD = .1880), *download* (M = .624, SD = .4816), *upload* (M = .612, SD = .4816), and *download/upload* (M = .552, SD = .4934). Subsequent Fisher-Hayter tests revealed that each of the action symbols resulted in significantly greater *interpretability* than the control, *p*s < .001. However, none of the tested icons were found to perform significantly better than the other (*p*s > .05).

The *bandit* had similar findings [$F(3, 1437.24) = 190.377$, $p < .001$]: control (M = .015, SD = .1175), *download* (M = .688, SD = .4699), *upload* (M = .650, SD = .4816), *download/upload* (M = .583, SD = .4934). Consistent with the *badge* findings, the control resulted in significantly lesser *interpretability* than each of the action symbols, *p*s < .001. However, in this condition, the *download* symbol was found to have significantly higher *interpretability* than the *download/ upload* symbol, $p < .004$.

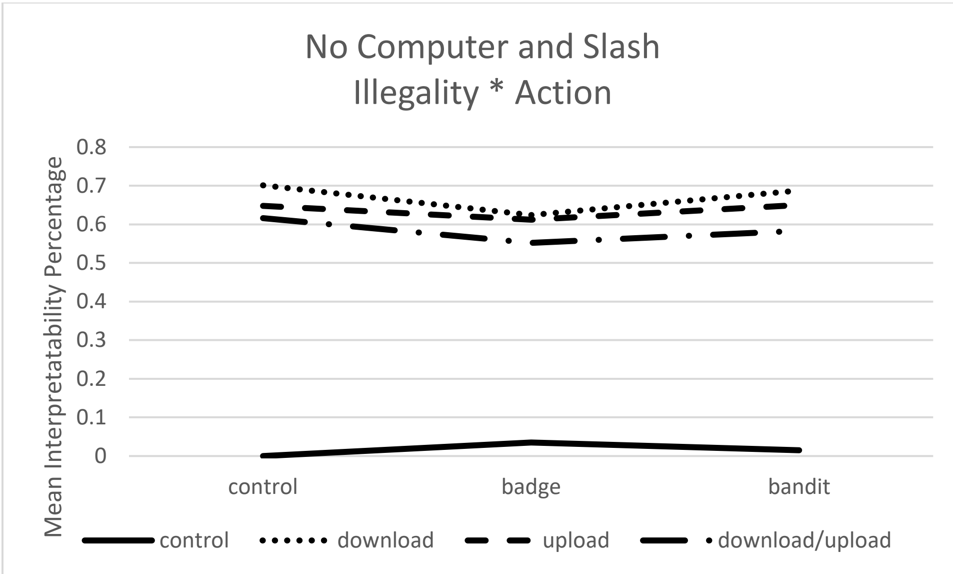



Figure 5. Mean interpretability of icons with no computer and with a slash as a function of illegality and action.

Thus, across all conditions, each action symbol consistently performed better than the control. In addition, the *download/upload* symbol generally scored lower than the *download symbol*. This suggests that the *download/upload* symbol scores lowest in *interpretability*, compared with the other action symbols, among icons that have a *slash* and no *computer*.

***Action x illegality interaction as a function of no computer and a cross.*** As illustrated in Figures 6 and 8, when there was a *cross* with no action, there was a statistically significant difference among the illegality icons, $F(2, 1437.240) = 24.639$, $p < .001$. Fisher-Hayter range tests indicated that *bandit* (M = .227, SD = .4229) and *badge* (M = .120, SD = .3289) performed better than control (M = .000, SD = .000), $p < .0001$ and $p < .0003$, respectively. Furthermore, the *bandit* outperformed the *badge* in *interpretability*, $p < .001$.

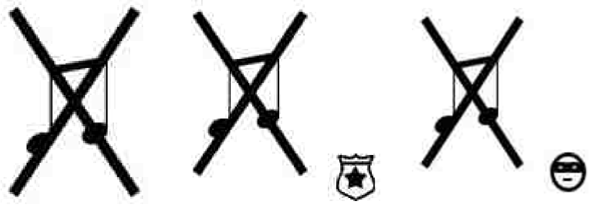


Figure 6. Icons with lowest to greatest interpretability: control, badge, bandit.

However, when action symbols are incorporated, as shown in Figures 7 and 8, the outcome was reversed; all illegality symbols were found to be inferior to the control group. For instance, when the action was a *download*, $F(2, 1437.240) = 4.769$, $p < .01$, the means for control (M = .703, SD = .4581) were significantly greater in interpretation accuracy than the *badge* (M = .615, SD = .4934) and *bandit* (M = .618, SD = .4816) with $p < .007$ and $p < .009$, respectively. However, there was no difference between *badge* and *bandit*, $p > .05$.

This pattern emerged under both *upload* [$F(2, 1437.240) = 5.195$, $p < .01$] and *download/upload* symbols [$F(2, 1437.240) = 109.396$, $p < .001$]. When the action was *upload* the means were: control (M =. 668, SD =.4699), *badge* (M = .567, SD = .4934), *bandit* (M = .595, SD = .4934). Under the *upload* symbol, the control performed significantly better than the *badge* ($p < .002$) and the *bandit* ($p < .03$). There was no statistically significant difference between the *badge* and the *bandit*, $p > 05$. For *download/upload symbol*, the interpretability scores from highest to lowest, respectively, were control (M = .604, SD =.4816), *bandit* (M = .534, SD = .5051), and *badge* (M = .159, SD =. 3759). The control had significantly better interpretability than the *badge* and the *bandit* $p < .001$ and $p < .03$, respectively. Contrary to the other action symbol results, the *badge* had significantly lower interpretability compared with the *bandit* ($p < .001$).

Therefore, in comparing the performance of illegality symbols with the *cross*, the control led to the best interpretability rates when compared with *badge* and *bandit*. No statistically significant differences between *badge* and *bandit* were found within the upload and download symbol conditions.  However, there was a surprisingly significant difference between *bandit* and *badge* when the *download/upload* symbol was applied.  This indicates that the *cross* symbol and the action symbol combination generally works best when there are no illegality symbols present.

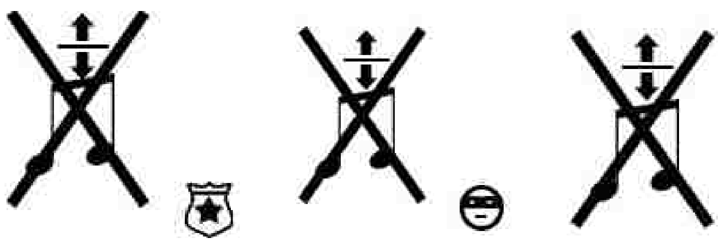


Figure 7.  Interpretability accuracy from least to greatest for cross symbols and no computer: badge, bandit, and control.

Likewise, as shown in Figure 8, simple effects tests indicated a difference among the action symbols as a function of no illegal symbol, $F(3, 1437.240) = 210.221$, $p < .0001$.  Fisher-Hayter range tests showed that there was significantly greater *interpretability* of the *download* (M = .703, SD = .4581), *upload* (M = .668, SD = .4699), and *download/upload symbol* (M = .604, SD = .4816) over the control (M = .000, SD = .000), *p*s < .00001.  In addition, the *download* symbol resulted in significantly better interpretational accuracy than the *download/upload* symbol, $p < .007$.   There were neither statistically significant differences between the *download/upload* and the *upload* symbols ($p > .05$), nor between the *upload* and the *download* symbols ($p > .05$).  All action symbols performed equally well when paired with a *cross* and no illegality symbol, with the *download* symbol having the greatest *interpretability* rates.

There were also statistically significant differences among the action symbols with regard to the *badge*, $F(3, 1437.240) = 131.042$, $p < .001$.  Both the *download* (M = .615, SD = .4934) and the *upload* symbols (M = .567, SD = .4934) were significantly higher in *interpretability* when compared with the *download/upload* symbol (M = .159, SD = .3759) and the control (M = .120, SD = .3289), *p*s < .001. There were neither statistically significant differences between the control group and the *download/upload* symbol nor between the *upload* and the *download* symbols, *ps* > .05. When using the *badge*, both the *upload* and the *download* symbols would improve *interpretability* equally.

For the *bandit*, there were statistically significant differences across the action symbols, $F(3, 1437.240) = 62.708$, $p < .0001$. Based on Fisher-Hayter range tests, the *download* (M = .618, SD = .4816), *upload* (M = .595, SD = .4934), and the *download/upload* symbols (M = .534, SD = .5051) were each significantly better than the control (M = .227, SD = .4229), *p*s < .00001. The *download* symbol was significantly higher in *interpretability* than the *download/upload* symbol ($p < .03$), but not the *upload* symbol ($p > .05$). There were no statistically significant differences between the *download/upload* and the *upload* symbols, $p > .05$. Thus, among the action icons tested, the *download/upload* symbol performed poorest among icons with a *bandit* and a *cross*.

Within all illegality conditions, the *download/upload* symbol generally resulted in the lowest *interpretability* rates among the tested action symbols when there was a *cross* with no *context*. Apart from icons that have a *badge*, the inclusion of all tested action symbols overall raised interpretation accuracy.

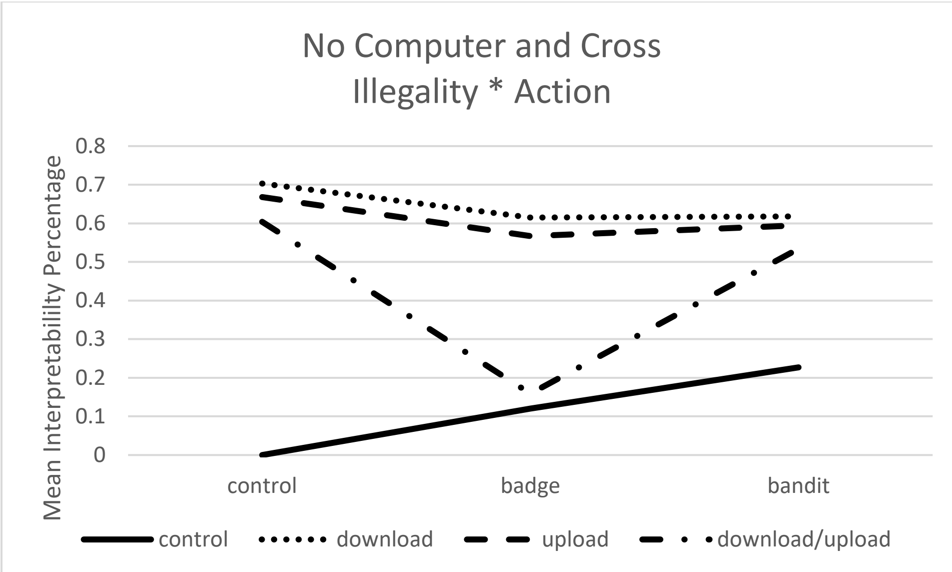



Figure 8. Mean interpretability across illegality and action combination for icons with a cross and no computer.

***Action x illegality interaction as a function of computer and a slash.*** In contrast to comparable icons without the computer, there were statistically significant differences in *interpretability* when there was no action included across illegality conditions, $F(2, 1437.240) = 37.928$, $p < .001$. As shown in Figures 9 and 10, the *bandit* (M = .263, SD = .4464) was significantly higher in *interpretability* than both *control* (M = .007, SD = .0822) and *badge* (M = .033, SD = .1880), *p*s < .001. However, there was no statistically significant difference between the *badge* and the control, $p > .05$.

Interestingly, there were no statistically significant differences among illegality symbols when the actions were *download* ($F(2, 1437.240) = .753$, $p > .05$), *upload* ($F(2, 1437.240) = 2.649$, $p > .05$, or *download/upload* ($F(2, 1437.240) = .919$, $p > .05$). Thus, none of the illegality symbols enhanced *interpretability* within *download*, *upload*, or *download/upload* conditions when the *slash* was used along with the *computer* for context. Together, these findings do not support the use of illegality symbols when paired with both action icons and a prohibitive symbol (e.g. slash and cross). Illegality symbols only demonstrated positive influence when there were no action icons.

Figure 9. Icons with computer and slash across illegality from least to greatest: control, badge, bandit.

Although the advantage of the illegal symbol is not supported, the action symbols were found to greatly enhance the interpretability of icons with and without illegality symbols. Within each of the subgroups of illegality symbols, each of the action symbols were found to significantly increase *interpretability*. When there was no illegal symbol, there were statistically significant differences among each of the action symbols compared with the control [$F(3, 1437.240) = 206.981$, $p < .001$]: control (M = .007, SD = .0822), *download* (M = .699, SD = .4464), *upload* (M = .690, SD = .4581), and *download/upload* (M = .580, SD = .4934). Although each of the action symbols performed significantly better than the control (*p*s < .001), the *download/upload* symbol received significantly lower *interpretability* scores than both the *upload* ($p < .002$) and *download* symbols ($p < .0007$).

Within the *badge*, the results were slightly different [$F(3, 1437.240) = 175.780$, $p < .001$]: control (M = .033, SD = .1880), *download/upload* (M = .621, SD =.4934), *upload* (M = .633, SD = .4816), *download* (M = .662, SD = .4699). Each of the action symbols performed significantly better than the control (*p*s < .001), but all other pairwise comparisons were nonsignificant (*p*s > .05).

This pattern was repeated with the *bandit* [$F(3, 1437.240) = 64.705$, $p < .001$]: control (M = .263, SD = .4464), *download/upload* (M = .587, SD = .4934), *upload* (M = .620, SD = .4934), and *download* (M = .668, SD = .4816). Each of the action symbols performed significantly better than the control (*p*s < .001) but unlike the *badge*, the *download* performed better than the *download/upload* symbol, $p < .04$. No statistically significant differences were observed between the *download/upload* and the *upload* symbols and between the *upload* and the *download* symbols (*p*s > .05). Based upon these findings, action symbols may enhance *interpretability* within icons that use a computer and a *slash*.

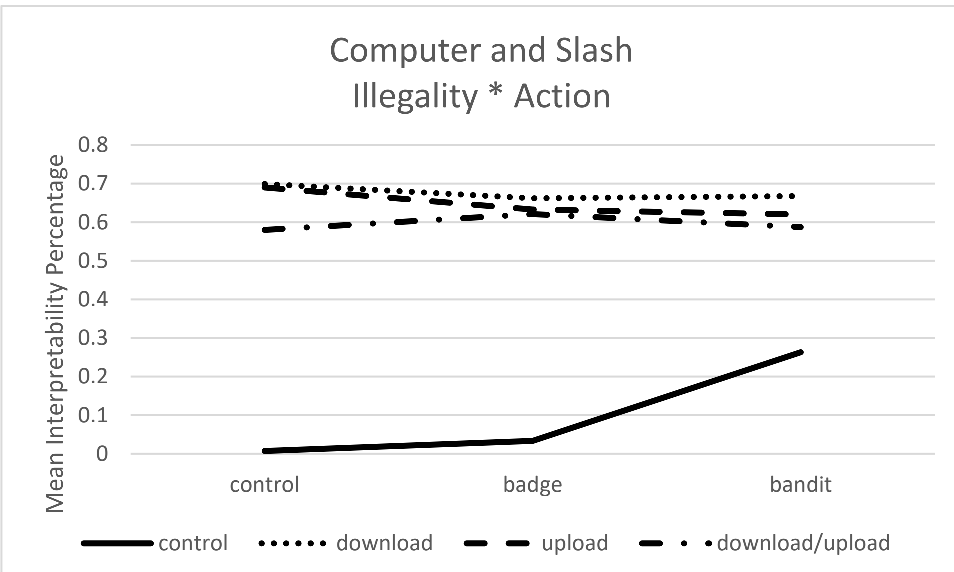



Figure 10. Mean interpretability of icons with computers and slash across illegality and action symbols.

***The Action x illegality interaction as a function of computer and a cross.*** As shown in Figures 11 and 13, there was a statistically significant difference among illegality symbols in *interpretability* when there was no action symbol and a *cross* [$F(2, 1437.240) = 16.589$, $p < .001$]: control (M = .015, SD = .1175), *badge* (M = .088, SD = .2819), *bandit* (M = .200, SD = .3994). Fisher-Hayter tests indicated that the *badge* ($p < .03$) and *bandit* ($p < .00001$) significantly improved *interpretability* over the control. Moreover, the *bandit* had significantly higher ratings than the *badge*, $p < .0006$.  Thus, this lends support to the notion that the *bandit* is more interpretable than the *badge* when the icon does not specifically communicate the action that should be avoided.

Similar to the previous finding of the computer with the slash, as shown in Figures 12 and 13, there was no statistically significant difference among illegality symbols when there was a *download* symbol [$F(2, 1437.240) = 1.813$, $p > .05$]:  control (M = .690, SD = .4581), *badge* (M = .629, SD = .4816), *bandit* (M = .652, SD = .4816). The same was true for *upload* ($F(2, 1437.240) = .632$, $p > .05$:  control (M = .668, SD = .4699), *badge* (M = .637, SD = .4816), *bandit* (M = .636, SD = .4816).  This indicated that illegality symbols neither enhanced nor worsened *interpretability* when these action symbols were incorporated in conjunction with a cross.

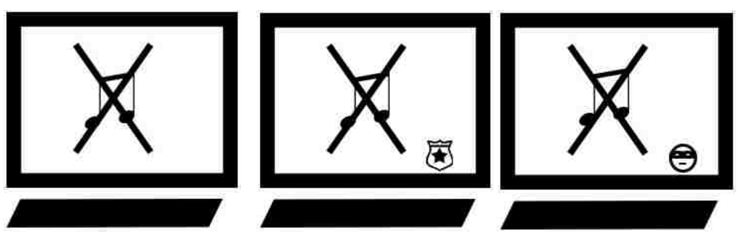


Figure 11.  Icons with computer and cross with no action symbols across illegal conditions from least to greatest interpretability:  control, badge, bandit.

Of note, there was a statistically significant difference among illegality symbols when the action symbol was the *download/upload* [$F(2, 1437.240) = 5.153$, $p < .01$]:  control (M = .577, SD = .4934), *badge* (M = .645, SD = .4816), *bandit* (M = .543, SD = .4934).  Under this combination, the *badge* performed significantly better than the control ($p < .03$) and the *bandit* ($p < .002$).  There was no statistically significant difference in *interpretability* ratings between the *bandit* and the control ($p > .05$).

Figure 12. Interpretability of icons with computer, *cross*, and *download/upload* across illegality conditions from lowest to greatest: control, bandit, badge.

Based upon previously aforementioned analyses, the *bandit* was generally found to elicit more accurate interpretations than the *badge*. However, in a separate ANOVA, it was also found that participants felt they would be significantly more *careful* with warnings containing a *badge* than with a *bandit*.

Furthermore, action icons again were found to increase interpretability, in general, within each of the illegal conditions and control. There were significant differences among action icons that contained no illegality symbols [$F(3, 1437.240) = 194.147$, $p < .001$]. Subsequent Fisher-Hayter tests showed that each of the action symbols performed significantly better than the control (M = .015, SD = .1175), *p*s < .002. The *download* symbol (M = .690, SD = .4581) received the highest ratings, followed by the *upload* (M = .668, SD = .4699) and the *download/upload* symbol (M = .577, SD = .4934). The *download* ($p < .002$) and *upload* ($p < .02$) symbols were significantly greater in interpretational accuracies than the *download/upload* symbol. However, there was no statistically significant difference between the *upload* and the *download* symbols in interpretational accuracy ($p > .05$).

Similar findings were observed with the *badge*, $F(3, 1437.20) = 144.043$, $p < .001$. The action icons were each significantly higher than the control (M = .088, SD = .2819), *p*s < .001.

But there were no statistically significant differences among *download* (M = .629, SD = .4816), *upload* (M = .637, SD = .4816), and *download/upload* (M = .645, SD = .4816) symbols, *p*s > .05.

Statistically significant differences were also evident under the *bandit* symbol, $F(3, 1437.240) = 84.835$, $p < .001$. Likewise, each of the action symbols had significantly higher *interpretability* rates than the control group (M = .200, SD = .3994), with *p*s < .001. The *download* symbol (M = .652, SD =.4816) performed significantly better than the *download/upload* symbol (M = .543, SD = .4934), $p < .003$. The *upload* symbol (M =.636, SD =.4816) also had significantly higher *interpretability* rates than the *download/upload* symbol ($p < .02$). Once again, there was no statistically significant difference between the *upload* and the *download* symbols ($p > .05$). Hence, in the aforementioned results, the *download* and *upload* symbols each performed better than the *download/upload* symbol and the control when paired with a *bandit*, a *cross*, and a *computer* for context.

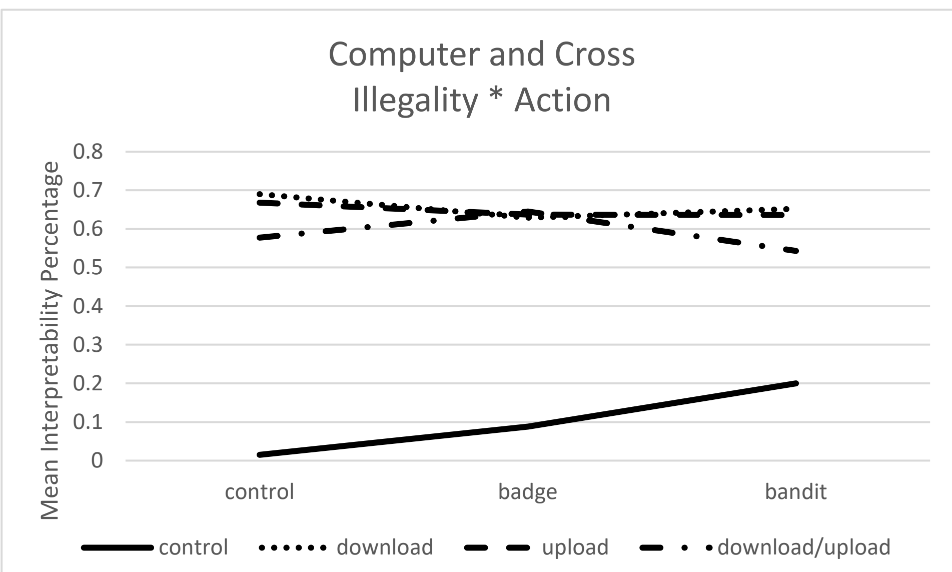



Figure 13. Mean Interpretability scores for icons with a computer and cross across illegality and action combinations.

Hence, across all illegality symbols and the control, the results supported the advantages of including an action symbol to warning icons with a *computer* and a *cross*. Furthermore, the *download/upload* symbol performed as well as the *download* and the *upload* icons only when the *badge* was included in the warning icon. Otherwise, the *download* symbol generally led to better interpretation outcomes compared with the other action symbols.

## Discussion

For this investigation's purpose, warning labels were custom designed and tested on the ability to convey the message that pirating music is illegal. Various symbols included within the icons were selected based on their potential to denote prohibition, illegality, and the action to be avoided. In adherence to past studies suggesting the benefits of providing context, each of the symbols were presented with and without a computer. To simplify results, the *interpretability* and *understandability* dependent variables will be addressed separately.

### Interpretability

Results showed that participants had difficulty drawing accurate meanings from the tested pictorials. Nevertheless, the interpretability findings supported several of the hypotheses. Icons containing any of the prohibitive symbols were successful in delivering the intended message. Similarly, icons containing action resulted in increased interpretability accuracy, with the *download* and *upload* producing the most positive results. As predicted, the addition of a computer image for context facilitated accurate responses among participants. Although there were no prior predictions for illegality icons, they overall enhanced participant interpretability. This finding was more apparent with the *bandit* than the *badge*.

Though illegality symbols generally benefitted icons with no prohibitive symbols, the combination of illegality and prohibitive symbols notably led to mixed results. Based on previous findings, coupling prohibitive symbols and illegality symbols together was expected to decrease comprehension, in part due to the lack of familiarity with these illegality symbols (McDougall et al., 1999), and possibly from the increased cognitive resources needed to process multiple visually complex features (McDougall, et al., 2006). The decrease in interpretability ratings from the addition of illegality symbols confirms that simple pictorials with minimal details enhance effectiveness (e.g., Ng & Chan, 2009; Rogers, 2000). The expected decrease in interpretability was evident in icons with a *cross*, a less used symbol for prohibition, but not with a *slash*. For the *cross*, however, only the *badge* led to lower rates of correct meaning as compared to the control and the *bandit*. The *badge* appeared to evoke misperceptions of safety and security, thereby potentially lowering accurate interpretations. Through implications of theft and piracy, the *bandit* proved less difficult for respondents. The results collectively suggest if illegality symbols are used, then, the *slash* is the better choice.

Moreover, the action and illegality interaction effects were evaluated while controlling for context and prohibitive icons. This approach was pursued, because space restrictions may limit the use of context in a warning, which was found to improve effectiveness (e.g., Garcia et al., 1994; Silver et al., 1995; Wolff & Wogalter, 1998). The decision to test illegality with prohibitive symbols was made in reference to the badge and official seals found in FBI piracy warnings. Currently used piracy warnings issued by the FBI, such as those displayed on movie videos, do not include prohibitive symbols, such as a *slash* or a *cross*.

**No prohibitive.** Context influenced whether illegality symbols paired with action symbols were interpretable without the assistance of a *slash* or *cross*. As illustrated in Figure 14, when the icon included a computer, for instance, the *bandit* was superior to the *badge* across all action symbol conditions (i.e., *download*, *upload*, *download/upload symbol*s), thus strengthening the support for the *bandit's* superior effect in interpretability, regardless of the absence of a prohibitive sign. In icons without a computer, as depicted in Figure 15, the *bandit* maintained greatest interpretability, but only when paired with either a *download* or a *download/upload* symbol. Under the *upload* symbol, as shown in Figure 16, both the *badge* and the *bandit* resulted in more accurate interpretations.

Figure 14. Badge and bandit with computer but no prohibition cue (upload symbol presented).

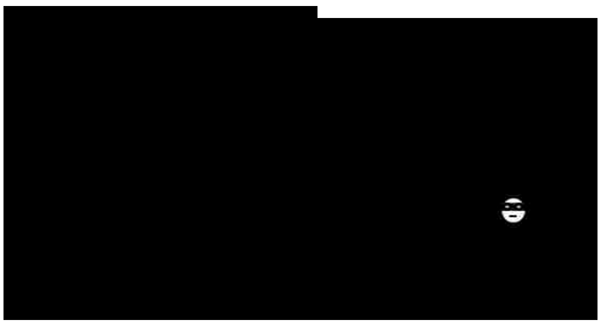


Figure 15. Badge and bandit with no computer and no prohibition cues (download/upload symbol shown).

Figure 16. Badge and bandit with no computer and no prohibition cues (upload symbol provided).

Past studies noting the benefits of providing context (e.g., Garcia et al., 1994; Silver et al., 1995; Wolff & Wogalter, 1998), support the findings indicating that the addition of computer symbols to icons without prohibitive symbols offers the greatest advantage in interpretability of a *bandit* symbol, a less commonly used visual relative to the *badge* with respect to music piracy. In addition to being less frequently encountered, the *bandit* may reasonably establish a more direct mental connection than the *badge*, with regards to the unlawfulness of the behavior. In this respect, in the absence of a prohibitive symbol, combining the *download* and *download/ upload* symbol with the *bandit* symbol might facilitate avoidance behavior. In contrast, law enforcement or official business, connoted by the *badge*, potentially led to false aforementioned associations with security or safeness. Under the *upload* symbol, however, both the *badge* and the *bandit* equally facilitated more accurate interpretations than the control, presumably because users do not consider safety and security issues as a threat when uploading relative to downloading. In an examination of risk factors associated with downloading behavior, computer users were concerned about introducing harmful computer viruses into their hardware (McCorcle, Reardon, Dalenberg, Pryor, & Wicks, 2012).

Together, these findings corroborate past research that context in warnings leads to less confusion (e.g., Silver et al., 1995; Vukelich & Whitaker, 1993; Wolff & Wogalter, 1998). In this investigation, results with context led to more consistent outcomes when compared without context. In the absence of context, mixed results are assumed to be traced to a variety of factors, such attitudes concerning music piracy, misunderstandings of the intended meaning, or sheer uncertainty, particularly when the prohibitive symbol is absent.

***Slash.*** Furthermore, comparisons between *computer* and *no computer* icons with various under pairings of illegal and action icons under a *slash* were examined. As shown in Figure 17, when there were no action icons, the control and the *badge* surrounded by a computer were equivalent in interpretation rates with only the *bandit* contributing to significant improvement, presumably because *bandit* connoted stealing.

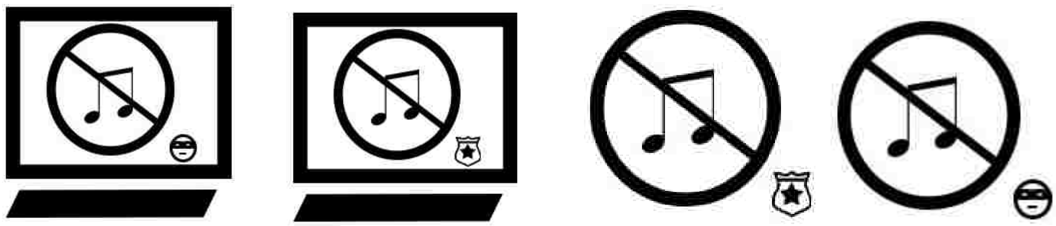


Figure 17. The first two icons represent context (computer), whereas the final two icons represent no context (no computer).

In contrast, without the *computer* for context, illegality symbols did not improve interpretability. Once again, this strongly suggests the necessity of providing context when adding visual depictions of illegality to icons. The ineffectiveness of illegality symbols in icons without *computer* icons and action symbols may be due to floor effects.

As shown in Figure 18, no statistically significant interpretability differences were observed among illegality icons consisting of a *slash*, but no computer, when paired with the *upload* and the *download/upload* symbol. However, the *download* symbol led to different results. Without the computer for context, participants accurately interpreted icons without an illegality symbol (i.e., control) better than those with the *badge* or the *bandit*, with the latter performing better when paired with a *download* symbol. Similar to previous observations in this study, respondents appeared to misinterpret the meaning of the *badge* in comparison with the *bandit*, particularly if a down arrow is included in an icon without a *computer* for context as a cue for *downloading*. In this respect, the down arrow without context may be associated with other meanings aside from download. For instance, some participants associated the down arrow with a “decrease in volume”. However, when a computer was included in this combination, there were no statistically significant differences among the illegality symbols for enhancing interpretability across the different action symbols tested. This finding reveals that the presence of context has an equally positive influence on icons consisting of both action symbols and *slash*, regardless of illegality symbol. Of note, when there were no illegality symbols, each of the action symbols substantially increased interpretability rates, with the *download* and *upload* icons receiving the greatest accuracy scores compared to the *download/upload* combination under both *computer* and *no computer* icons.

Figure 18. Control, badge, and bandit icons with slash and download.

Furthermore, within each illegality icon, there were increases in interpretability when action symbols were included, with *download* icons generally performing the best. In combination, though the use of the *bandit* did led to increased interpretations under certain situations, findings suggested that action icons may have greater influence on interpretation success than do illegality icons. Findings also collectively suggest that it becomes increasingly more difficult for viewers to cognitively process illegality symbols with otherwise conventional symbols. This supports past findings that simpler and less complex icons are ideal when devising warning icons (McDougall et al., 2000).

***Cross.*** When a *cross* was applied as a prohibitive symbol, as depicted in Figure 19, both illegality symbols improved interpretability, regardless of the inclusion of context when there were no action symbols. In agreement with previous findings, the *bandit* increased interpretation over the *badge*. When actions were added to non-computer icons, the addition of the illegality symbols decreased interpretation across all action conditions. Furthermore, though the control continued to demonstrate high performance, the *badge* led to much lesser interpretability rates than the *bandit* when the *download/upload symbol* was included. Given the previous findings in this study, critical confusion is presumed to occur when visually ambiguous symbols, such as the *badge* and the *download/upload* symbol are contained within an icon that [redacted] red with no computer and a [redacted]

However, examination of icons with context (i.e., computer) found reversed findings across action symbol conditions. When the computer was included, as illustrated in Figure 20, the addition of an illegality symbol did not demonstrate a significant difference under a *download* or *upload* symbol. Under the *download/upload* symbol, however, the *badge* elicited more correct interpretations than both the control and the *bandit*. Though this unexpected finding may be regarded as an anomaly, the explicit nature of the *download/upload* symbol with an added contextual component may have significantly elevated interpretability of the *badge* over the *bandit* and the control. In addition, in agreement with results of the *slash*, both *computer* and *non-computer* icons benefitted from the action symbol and cross pairings, when there were no illegal symbols included. These findings agree with suggestions from previous warning literature recommending the pairing of pictorials of avoided actions with prohibitive symbols for successful transmission of referent message (e.g., Hammond et al. 2004). Symbols that offer more clarity or information concerning context, action to be prohibited, and illegality can positively influence objective measures of comprehension in music piracy warnings.

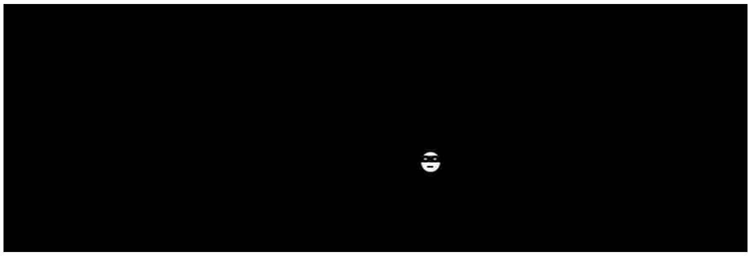


Figure 20. Control, bandit, and badge icons, within a computer context, paired with a download/upload symbol.

**Understandability**

Comprehension was also evaluated under a separate analysis of understandability ratings. Disagreements observed between understandability ratings and interpretability accuracy results may be due to a small correlation coefficient. Although the more familiar *download* symbol performed better than the *upload/download* icon, for instance, action icons overall were surprisingly rated low in understandability by respondents. Understandability ratings were not evidently affected by context, despite data showing increased interpretability rates for pictorials containing a computer. Based on these self-reports, respondents appeared to believe that icons with illegality symbols are difficult to understand, particularly icons containing the *bandit*. Understandability ratings supported the prediction that pairing prohibitive symbols (*slash* and *cross*) with illegality symbols (*badge*, *bandit*), would be perceived as more confusing to participants. These findings indicate that icons with uncommon symbol combinations may compromise views on perceived comprehensibility.

Inclusion of illegality symbols appears to benefit icons that do not contain any prohibitive symbols. Furthermore, the different outcomes found between questions intended to assess comprehension, open-ended questions (*interpretability*) and the self-report ratings of understandability, demonstrate that respondents may give incorrect interpretations to symbols that they believe are allegedly understandable. Conversely, they may believe that they do not understand symbols, when in fact they do, based on their accurate interpretations. More in-depth investigations with regards to the reason for these unexpected results are warranted.

Previous experienced stimuli may confound self-ratings of understandability in both directions. Exposure to stimuli in the past, for example, can falsely mislead one to believe that they comprehend material (Carroll & Mason, 1992; Whittlesea, 1993). Conversely, respondents may falsely assign lower understandability ratings to correctly interpreted icons, due to lack of previous experience with the presented symbols.

**Attention**

Warning icons should be noticeable amidst a variety of environmental distractions, such as other nearby symbols or the intense focus required to meet task-related goals (Most, Scholl, & Clifford-Simons, 2005) via a computer or device. Although both illegality symbols, specifically the *bandit*, were expected to enhance attention, only the *badge* led to increased attention ratings. However, other features such as context and prohibitive symbols improved attention ratings, even though the *cross* was rated lower than the *slash*. In contradiction with expectations, the action icons did not increase salience over controls.

Considering its observed strong correlation with compliance ratings, mixed patterns found with attention ratings may be indicative of the role of factors unrelated to visual image components. Past studies, for instance, assert that judgments on visual salience may be heavily influence by familiarity (e.g., Roediger, 1990). Outside the study itself, there are increased opportunities for exposure with the *badge* in FBI piracy signs over the *bandit*. Compounded experiences may also have impacted high attention ratings given to the ubiquitous *slash*. The additive effects of certain symbols, such as the enlarged computer image in this study, can help draw attention particularly when the added pictures are legible and simple (e.g., Laughery & Young, 1991). The failure of action icons to achieve salience over the control, however, may indicate that their function to increase comprehension overrides their ability to increase attention. Participant exposure to the 72 icons designed to be a referent of one meaning, increased their familiarity and possibly perceptions of attention to the presented stimuli. In contrast, warning research also commonly points out that over exposure may lead to inattention to stimuli, known as habituation (e.g., Amer & Maris, 2007). Due to the design of the current study, it is likely that participant perceptions did not capture habituation effects. Thus, supplementing these attention ratings with more objective courses of measurement is required.

**Carefulness and Compliance**

Carefulness refers to the extent to which individuals will act with caution or hesitance when coming across a warning. Results indicated that context, prohibitive, and action symbols each contributed to increased carefulness ratings. The *badge* and *bandit* both improved carefulness as compared to the control, with the *badge* receiving higher ratings than the *bandit*. Similarly, both prohibitive and action symbols equivalently increased carefulness over the control.

With regards to compliance, however, different results emerged. The *badge* and the control were equivalent in compliance ratings, and both exceeded *bandit* scores. This refuted the prediction that illegality icons would raise compliance ratings. Nevertheless, the prediction that the *badge* would draw higher compliance ratings, presumably because of complexity, was supported. Of note, the bandit was hypothesized to have a closer association with illegality than the badge. It was evident, however, that icons showed greatest improvement in interpretability when including a *bandit*. Therefore, previous exposures to the badge via FBI warnings is again likely to have induced higher compliance ratings.

Compliance ratings deviated from carefulness ratings under prohibitive symbols. Context and prohibitive symbols did not raise compliance scores. The low compliance ratings may be due to the sample of young adolescents, who typically have a lower sense of self control compared to other age demographics (Malin & Fowers, 2009). Thus, further measures are needed in deterring behavior, such as educational campaigns or through explicit text.

Other than self-control, findings can be interpreted to reflect the muted attitudes associated with the severity of this crime (Shanahan & Hyman, 2010). The provision of context raised carefulness ratings, but did not increase compliance ratings. With regards to the prohibition symbols, carefulness ratings, but not compliance ratings, were increased with the addition of the *slash* and the *cross*. Furthermore, although both illegality symbols raised carefulness ratings, the *badge* and *control* elicited higher compliance scores. The possibility of the respondents' unfavorable reaction in associating the *bandit* with one who engages in music piracy, serves as a causal interpretation of these results. Similarly, carefulness was high among all action icons. However, respondents reported that they would least comply to icons depicting action icons, with exception to the *download* symbol, thus contradicting expectations. The stronger compliance ratings for *download* icons may plausibly reflect respondents' concerns of being infected by a computer virus (McCorkle, Reardon, Dalenberg, Pryor, & Wicks, 2012). Beyond the implementation of adequate warning icons, low compliance ratings indicate that concerted efforts toward synchronizing legal, educational, and preventative measures can support the deterrence of digital piracy (Gopal et al., 2004).

Though the observed statistically significant correlation indicates that symbols with high carefulness ratings tended to receive increased compliance ratings, results indicate that symbols may cause respondents to hesitate, but not necessarily comply with the message. As the ultimate objective of warning labels, compliance can be achieved through the implementation of other risk communication measures to address other influential factors, such as the viewers' perceptions of risk, attitudes and beliefs of the referent message (e.g., Chiou et al., 2005)

**Representativeness**

In accordance with recommendations to include target users in the design of a warning label (Davis, et al., 2006), the final set of questions requested respondents to rate how representative the icons were to the target meaning. Though representativeness showed the weakest relationships with the counterpart dimensions, it exhibited the strongest correlations with perceptions of carefulness and compliance. Results revealed that context increased representativeness ratings. Furthermore, respondents found the *badge* to better represent the target message than did the *bandit*. In addition, the *slash* was rated higher than the control in representativeness. Representativeness was also enhanced by the addition of the *download* and *download/upload* symbols as compared to the *upload symbol*.

One explanation for the lower correlational coefficients with other dimensions is that people may have varying views on what constitutes a pictorial as representative. The relatively small correlations can also be explained by highly rated icons that did not necessarily translate to greater interpretational accuracy, such as the *badge*, and the *download/upload* button. Similar to findings that emerged in attention and understandability ratings, the subjective nature of these representativeness scores may result from previous experience with the presented stimuli, as supported by the high ratings given to icons with the *badge*, a symbol currently incorporated in

FBI piracy warnings. Respondents additionally gave higher representativeness ratings to the *download/upload* symbol. This implies that explicitness and salience are generally regarded as critical features when selecting symbols denoting action, because aside from being visually distinct from the customarily used *up* and *down* symbols, the *download/upload symbol* clearly consolidates both relevant actions into one. Given its substandard scores and ratings in other dimensions examined in this study, high ratings in representativeness suggest that the use of the *download/upload* symbol may have some promise of being as effective as the up and down arrow, if supplemented by increased exposure, educational campaigns, or training (Gopal et al., 2004).

## Recommendations

Findings revealed a statistically significant, yet small, correlation between subjective (*understandability*) and objective (*interpretability*) measures for comprehension. However, all subjective ratings showed moderate to high relationships with one another. The correlation analyses reveal that actual comprehension (*interpretability*) is clearly distinct from viewers' judgements of the warning with regards to understandability, attention, carefulness, compliance and representativeness.

**Interpretability.** To increase the interpretability of music piracy warning icons, it is proposed that symbols depicting, prohibition, action, and context be applied. The symbols that were found to have the most positive impact on interpretation were the *slash*, *cross*, *download*, and *upload* symbols. Though both the *badge* and *bandit*, signifying illegality, were found to overall improve interpretability, a deeper analysis revealed that their effects were dependent on the presence of the prohibitive symbol. When there are no prohibitive symbols, both illegality symbols, particularly the *bandit*, improved interpretability. Warning pictorials including a *cross* or *slash* generally did not perform better when an illegality symbol was present compared with controls.

**Warning perceptions.** The current study examined how the tested symbols differentially affected each of the warning effectiveness dimensions. The use of computer for context did not impact understandability scores, but improved attention, carefulness, and representativeness ratings. Though action symbols did not improve understandability and attention, they did increase carefulness and representativeness ratings. The *download* symbol particularly tended to consistently receive the highest ratings. Prohibitive, especially the *slash,* led to increases in understandability, attention, carefulness, and representativeness ratings.

Illegality results, however, showed more inconsistent patterns. The *badge* and the *bandit* appeared to decrease understandability ratings, regardless of prohibitive symbols. Illegality symbols led to increased carefulness ratings, especially the *badge*. However, only the badge related to higher attention and representativeness ratings. These findings may overall be interpreted to indicate viewers' disagreement with the connoted association between music piracy and theft created when the *bandit* is used.

The chief indicator of optimal warning effectivess is linked to compliance (e.g., Wogalter, 2006). This study found that none of the symbol categories contributed to perceived compliance. However, specific symbols, such as *badge* and *download* exceeded the compliance ratings of their counterparts.

The subjective nature of these ratings requires validation with more objective measure for effectiveness. However, based on the findings, the *slash*, the *download*, and the computer symbol for context, appeared to consistently receive the highest ratings across all measured perceptual dimensions. These symbols were among those that were found to be highest in interpretability.

**Limitations**

The purpose of Study 1 was to identify potential icons as components of viable warnings used for Study 2. However, future studies can explore other measures that will increase consistency between objective and subjective measures for comprehension. In this study, the divergent pattern found between interpretation accuracy rates and self-reports of understandability indicated that the retrieved information may not necessarily coincide with the icon's intended message. For example, familiarity or experience with a visual image may cause overestimations in understandability ratings (Moore & Healey, 2008; Whittlesea, 1993). Likewise, the "open-ended" method used to capture comprehension of the pictorials, may have underestimated interpretation accuracy (Lesch, 2017) arising from the elimination of vague or incomplete responses. Future studies may benefit from by using simpler to understand and/ or less time consuming procedures to assess music piracy warning comprehension. For instance, Lesch (2017) recommended Davies and colleagues' (1998) proposal to include open-ended questions requesting respondents to specifically describe both the nature of the hazard and the actions necessary for compliance, in efforts to provide more guidance and structure to the written-out responses. Therefore, as an alternative to simply requesting for the meaning of the icons, including prompts to induce respondents in describing the hazard, the necessary actions, and the potential consequences may help minimize vague or incomplete responses.

Another limitation concerns the space allocated to each of the symbol categories in the creation of the pilot icons. Future studies may consider examining how different sized symbols can impact effectiveness perceptions and interpretability. Illegality symbols, for instance, were notably smaller in size relative to the whole warning icon and resulted to less consistent patterns than other symbol categories. Future investigations can thus aim in gaining a better understanding of how both size and quality of symbol components can affect warning effectiveness. Given that a symbol of a *badge* is customarily used in FBI anti-piracy warnings, its effects must be empirically tested against other symbols that represent illegality. Current findings notably suggest that *bandit* is more interpretable than the *badge*, but needs to be verified via follow up tests.

**Future Directions**

The purpose of Study 1 was to identify potential music piracy warning symbols that met industry standards for comprehensibility. However, to achieve full comprehension, the symbols denoting nature of hazard and restricted behavior must be accompanied by text to clarify level of hazard or risk, and associated consequences. The completion of the warning design required the pairing of the most understood pictorials with various message conditions. Study 2 was conducted to fulfill this objective.

First, icons were selected based on the interpretability rate as determined by the open-ended question. The responses must contain any of the following combination of descriptive terms to be regarded as correct: piracy, music downloading is illegal, music uploading is illegal, do not download, and do not upload music. If the responses contained these terms or an equivalent connoting that the actions were forbidden, then it was scored as correct and given a code of 1. However, other responses such as “no streaming” or “no music”, were not scored as correct because there was no association with music piracy.

As indicated in Table 9, icons that had 95% confidence intervals passing the ISO standard of 67% interpretability rate were then selected.  Because *interpretability* questions were presented first, participant fatigue was ruled out as an explanation for blank responses.  Under the presumption that blanks indicated confusion or uncertainty, *interpretation* rates were calculated by including participants who did not fully complete the survey, resulting to 224 participants in total.  In this study, there were only four icons that passed the ISO standard of 67% comprehension (interpretability) rate:  icon1 (*computer slashed-upload*), Icon 2 (*computer, slashed-download*), Icon 3 (*no computer, slashed-download*), and Icon 4 (*no computer, crossed-download*) as shown in Figure 21.

After the initial interpretability screening, as provided in Table 10, *understandability*, *compliance*, *carefulness*, *attention*, and *representativeness* ratings were observed.   Highly interpretable icons were originally planned to have an average rating of at least 5 out of a 9-point scale.  The top icons averaged below this mid-point in all the subjective rating scales, with exception to Icon 2 (*computer, slashed-download*) and Icon 3 (*no computer, slashed-download*), with understandability averages of 5.08 and 5.43, respectively.  Average scores for all icons across all measured dimensions (e.g., understandability, compliance, etc.) generally ranged between 4.09 and 4.96, with exception to Icon 4 (*no computer, crossed-download*), with an average compliance rating of 3.91.  The lower than expected subjective ratings for these icons is reasoned to reflect the challenges in developing warning icons that can perform well in all 4 measured dimensions across a wide target audience.  These ratings underscore warning labels' supportive as opposed to all-encompassing role, in deterring music piracy within an entire risk communication system.

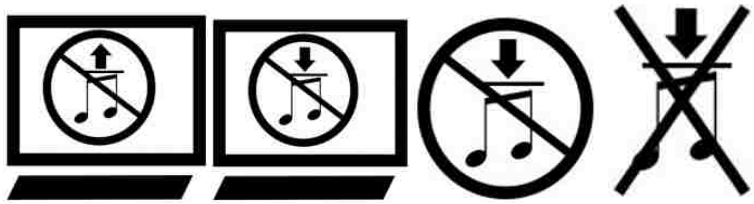


Figure 21. The four icons from Study 1 meeting the 67% interpretability accuracy rate from left to right: Icon 1 (*computer, slashed upload*), Icon 2 (*computer, slashed download*), Icon 3 (*computer slashed download*), Icon 4 (*no computer, cross download*).

## Study 2

It is widely accepted within the risk communications literature that warnings become more effective when pictorials are accompanied by signal words and warning messages. Signal words not only help communicate the severity of the warning as but also increase saliency by manipulating perceptions of hazard and arousal strength both in computer mediated messages (Amer & Maris, 2007) and in print (e.g., Braun & Silver, 1995). Saliency is particularly important when safety information is not actively sought as in the case of privacy warnings (Larose & Rifon, 2007). Studies revealing low perceptions of risks associated with intellectual piracy (McCorkle, Reardon, Dalenberg, Pryor, & Wicks, 2012) further support the need to remind users that copyright infringement is illegal.

### Signal Word

The signal word variable will include four levels: no signal word (control), NOTICE, IMPORTANT, and STOP. These words were chosen because they were more informational in nature and conveyed no injury risk as compared to the conventional signal words used in research such as CAUTION, WARNING, and DANGER (Wogalter & Silver, 1995). Furthermore, Wogalter and Silver (1995) found that these words were highly understandable across populations (e.g., grade school students, college students, non-native English speakers and elderly). Carefulness ratings were highest with STOP (college: 6.43; non-native: 6.55), IMPORTANT (college: 5.06; non-native: 5.64), and NOTICE (college: 4.01; non-native: 3.64). Previous research supported the utility of signal words in conveying accurate information regarding the hazard in addition to enhancing noticeability qualities (Wogalter et al., 1992).

The differences in messages communicated by these signal words are highlighted by examining their formal definitions in English language. According to the Webster's dictionary, the word STOP, means to “cause to give up or change a course of action” (Mirriam-Weber’s collegiate dictionary, n.d.). The word IMPORTANT suggest having great meaning or influence (Miriam Webster Word Central, n.d.). NOTICE may be viewed as a warning or indication of something, but also may be synonymous with attention (Miriam Webster Word Central, n.d.). Thus, a comparison among the signal words was performed to determine differing severity perceptions of the illegal act.

*Hypothesis 1:* Icons with signal words will be significantly higher in carefulness and noticeability ratings than the control (no signal word).

*Hypothesis 2:* The words NOTICE, IMPORTANT, and STOP, will be rated from lowest to highest respectively, with regards to carefulness. The word NOTICE will be statistically significantly rated lower in carefulness relative to STOP. IMPORTANT is predicted to be equivalent to STOP (Wogalter & Silver, 1995).

**Warning Message**

The inclusion of a warning message assists in emphasizing or providing essential information not conveyed visually through the icon. Explicit messages provide saliency and facilitate comprehension so that the user can effectively evaluate the level of risk and the type of hazard that may be confronted (e.g., Heaps & Henley, 1999; Rousseau et al., 1998). In addition to clearly presenting severe consequences (e.g., Laughery & Smith, 2006), studies indicated that shorter messages are ideal in warning communications. For instance, presenting information in a numbered list format as opposed to regular text was found to increase compliance (Frantz, 1994). Similarly, participants complied more with instructions that are in outline form as opposed to paragraphs (e.g., Laughery & Wogalter, 2011). In addition, the message must be noticeable and memorable (Andrews, 1995), with the length (Lehto & Miller, 1986) and wording (Heaps & Henley, 1999) potentially influencing retention and comprehension (Lehto & Miller, 1988; Zuckerman & Chaiken, 1998). Warnings that were brief, focusing on irrational behavior, and written in a fourth-grade level were found to change gambling behavior (Floyd, Whelan, & Meyers, 2006).

The five warning message conditions will be presented factorially in combination with signal words and severity and type of consequence for the end-user:

- No warning message (with signal word)
- Signal word with message #1: "This is illegal"
- Signal word with message #2: "This is illegal. You may be fined."
- Signal word with message #3: "This is illegal. You may be monitored."
- Signal word with message #4: "This is illegal. You may be monitored and you may be fined."

The Flesch-Kincaid readability index determining prospective grade level (Flesch, 1948) for the warning messages was applied. The readability index scores are inversely related to grade level. The highest grade level among the proposed warning message was 5.2 as shown in the Table 11. Of note, when the Flesch-Kincaid Grade level was conducted on "This is illegal. You may be fined," the grade that was issued was 0.9, which indicates approximately 1$^{st}$ grade level. However, other readability formulas notably listed different grade levels (in parentheses), such as Gunning-Fog Score (7.1), Coleman-Liau Index (6), and SMOG Index (6) (Online-Utilitiy, n.d.). The difference in grade level ratings may have been based on a word meaning that is understandable to young children. For instance, "fine" may have been associated with its adjective form, good, as opposed to the noun form, meaning a penalizing fee.

*Hypothesis 3:* Icons with warning messages will be rated significantly higher in attention and in likelihood of compliance than icons without messages.

*Hypothesis 4:* Icons with warning messages that convey consequences will be rated significantly higher in attention and likelihood of compliance than icons that do not convey consequences.

*Hypothesis 5:* Icons with the warning message "you may be fined" will be significantly higher in likelihood of compliance compared to the control condition and "you may be monitored".

## Method

### Participants

Of the 340 responses obtained from undergraduate students in fulfillment of partial credit for an Introduction to Psychology class, 120 of the cases had missing data and were eliminated from analysis. Therefore, a total of 220 participant responses were used for this study.

There were 37.3% males (*n* = 82) and 62.7% females (*n* =138). A majority were Caucasians (40.5%, *n*= 89), Hispanics (24.5%, *n* = 54), or of Asian (16.8% *n* = 37) origin. African Americans made up 7.3% (*n* =16), Native Hawaiian/ Pacific Islander (5.5%, *n* =12) and Other (5.5%, *n* =12). Approximately half of the sample comprised of 18 (19.5%, *n* = 43) and 19 (28.6%, *n* = 63) year olds. The mean age of the sample was 20.8 years old with a range from 18 to 41 years of age (SD = 3.745). A majority of the respondents stated that they were Full Time students (89%, *n* =196). Two students did not indicate their student status. Freshman and Sophomores mainly completed the survey, with 37.3 % (*n* = 82) Freshmen, 32.7% Sophomores (*n* =72), 19.1% (*n* = 42) were Juniors, and 10.5% (*n* =23) were Seniors. 1 person did not indicate student status. 76.8% of the respondents reported that their primary family language is English (*n* = 169) whereas 23.2% indicated it was not (*n* = 51). 31.8% (*n* = 70) of respondents stated that they used peer to peer networks, whereas 67.7% (*n* = 149) indicated that they did not, and 1 person did not answer (.5%). 14.5% reported that they have uploaded music onto the Internet (*n* = 32), whereas 85.5% (*n* = 188) reported that they did not. 64.1% of respondents reported that they downloaded music on the Internet (*n* = 141) whereas 35.5% (*n* = 78) indicated that they did not. 70.9% of the respondents reported that they believed that uploading copyrighted music is illegal (*n* = 156) whereas 28.2% (*n* = 62) reported that they did not think it was illegal. 70.9% believed that downloading copyrighted music is illegal (*n* = 156), whereas 28.2% (*n* = 62) believed that downloading copyrighted music was not illegal, and 2 respondents did not answer. Only 19.1% disagreed that uploading was morally wrong ($n$ = 42). A majority of the respondents neither agreed nor disagreed (42.3%, $n$ = 93), whereas 38.3% of the respondents agreed ($n$ = 82). Three of the respondents did not answer the question. 21.9% ($n$ = 48) disagreed that downloading music was morally wrong, 38.6% ($n$ = 85) neither agreed nor disagreed, whereas 39.1% ($n$ = 86) agreed that downloading music was morally wrong.

**Procedure**

Similar to Study 1, Study 2 was administered through an on-line survey application, Qualtrics, to UNLV students. After agreeing to the consent form, the participants were presented with the following instructions:

> *"You will be seeing a series of icons one at a time. You will be asked to rate each icon on features such as, understandability, attention-getting, and likelihood of compliance. After the presentation of several icons, there will be a 30 second rest period. There will be a total of 3 rest periods throughout the experiment. An online questionnaire requesting for basic demographic information, such as sex, age, and class year, will immediately follow. In addition, attitudes and behaviors specific to the study's main focus will be presented."*

The same question items using the 9-point rating scale from the first study were utilized in this study (Appendix C). However, the open-ended question requesting the meaning of the icon was excluded in the second study.

The median amount of time was 35 minutes to complete. Basic demographic information along with behaviors and attitudes in relation to music uploading and downloading were collected using the same questionnaire as the first study (See Appendix C). Examples of the stimuli used are found in Appendix F.

## Results

### Preliminary Analysis

Outliers were removed by eliminating data that had z-scores greater than the absolute value of 3.29 ($p < .001$). Based on this criterion, no outliers were removed. Normality was assessed through scanning the Normal Q-Q plots. If there was some evidence of non-normality in the plots, only slight deviations from normality (i.e., number and distance away of dots from straight diagonal line) were observed. Although violations of homogeneity of variance within dependent variables were indicated through statistically significant Box's M findings, it was determined that the repeated measures design and large sample size would assist in keeping Type 1 error rate around the nominal level and power sufficiently high.

Although the dependent variables were highly correlated, as shown in Table 12, thus constituting a potential problem in multicollinearity, the dependent measures were treated separately because of the specific hypotheses postulated. High correlations among self-rated dimensions reveals the associations that a warning's representativeness in addition to the perceived ability of warnings to induced understandability, carefulness, attention, compliance are related with another.

### Design

A 2 (sex) x 4 (icon – 1, 2, 3, 4) x 3 (signal word – STOP, IMPORTANT, NOTICE) x 5 (message – signal word only; signal word and Message 1; signal word and Message 2; signal word and Message 3; signal word and Message 4) mixed model (1- between, 3-within) MANOVA was computed with understandability, salience, carefulness, compliance, and representativeness as the dependent variables. Means and standard deviations for all factorial combinations are provided in Table 13. As indicated in Table 14, sex was not a statistically significant main effect, Wilks's λ = .971, $F(5, 214) = 1.272$, $p > .05$, η2 = .029, observed power = .447. However, there were statistically significant main effects among icon, Wilks's λ = .634, $F(15, 204) = 7.846$, $p < .001$, partial $\eta^2 = .366$, observed power = 1.00; signal, Wilks's λ = .778, $F(10, 209) = 5.966$, $p < .001$, partial $\eta^2 = .222$, observed power = 1.00; and message, Wilks's λ = .240, $F(20, 199) = 31.560$, $p < .001$, partial $\eta^2 = .760$, observed power = 1.00. In addition, there were statistically significant interactions between icon x message, Wilks's λ = .620, $F(60, 159) = 1.621$, $p < .01$, partial $\eta^2 = .380$, observed power = .999; and signal x message, Wilks's λ = .697, $F(40, 179) = 1.946$, $p < .01$, partial $\eta^2 = .303$, observed power = .999. No statistically significant higher order interactions were observed.

**Univariate ANOVAs**

The procedures in identifying statistically significant interactions in the ANOVAs were replicated from Study 1. Moreover, the same procedure that was applied in Study 1 with regards to sphericity adjustment were conducted using the Greenhouse-Geisser and Huynh-Feldt probabilities. Likewise, main effects and interaction effects were considered statistically significant, if they did not exceed the Bonferroni correction *p* level of .01 (.05/5) and .002 (.01/5).

**Icon.**

***Understandability.*** As indicated in Table 15, statistically significant differences in understandability were found among icons, Mauchly's $W = .727$, $\varepsilon = .857$, $p < .001$, $F(2.532, 551.878) = 26.954$, $p < .01$ The order of tested icons from highest to lowest were Icon 2 (*computer, slashed-download*) (M = 5.490, SD = 1.86), Icon 3 (*no computer, slashed-download*) (M = 5.327, SD = 1.80), Icon 1 (*computer slashed-upload*) (M = 5.156, SD = 1.90), and Icon number 4 (*no computer, crossed-download*) (M = 4.859, SD = 1.90). Subsequent Fisher-Hayter tests revealed that respondents rated Icon 2 (*computer, slashed-download*) significantly greater in understandability than both Icon 4 (*no computer, crossed-download*) ($p$ < .00001) and Icon 1 (*computer slashed-upload*) ($p$ < .00007). Icon 3 (*no computer, slashed-download*) was also significantly greater in rated understandability than Icon 4 (*no computer, crossed-download*) ($p$ < .00001). Icon 1 (*computer slashed-upload*) was also significantly higher in understandability ratings than Icon 4 (*no computer, crossed-download*) ($p$ < .0005). Thus, according to the results, Icon 2 (*computer, slashed-download*) was found to be greatest in understandability whereas Icon 4 (*no computer, crossed-download*) was rated as least in understandability.

***Carefulness.*** As indicated in Table 16, there were statistically significant differences among the icons with regards to carefulness ratings, Mauchly's $W$ = .623, ε = .842, $p$ < .001, $F$(2.527, 550.834) = 14.313 , $p$< 01. In order from highest to lowest was Icon 2 (*computer, slashed-download*) (M = 5.284, SD = 1.65), Icon 3 (M = 5.200, SD = 1.63), Icon 1 (*computer slashed-upload*) (M = 5.078, SD = 1.78) and Icon 4 (*no computer, crossed-download*) (M = 4.951, SD = 1.70). Fisher-Hayter pairwise comparisons found that Icon 2 (*computer, slashed-download*) was significantly higher in carefulness ratings than both Icon 4 (*no computer, crossed-download*) ($p$ < .00001) and Icon 1 (*computer slashed-upload*) ($p$ < .002). Icon 3 (*no computer, slashed-download*) was significantly greater than Icon 4 (*no computer, crossed-download*) in carefulness ratings ($p$ < .00006). All other pairwise comparisons were nonsignificant. Thus, similar to the understandability results, Icon 2 (*computer, slashed-download*) received the highest carefulness ratings whereas Icon 4 (*no computer, crossed-download*) received the lowest in carefulness ratings.

***Attention.*** As seen in Table 17, there were statistically significant differences among the icons regarding attention ratings, Mauchly's $W$ = .474, $p$ < .001, ε = .696, $F$(2.088, 455.230) =

25.995, $p < .001$. The icons from greatest to lowest in attention-getting were Icon 2 (*computer, slashed-download*) (M = 5.219, SD = 1.53), Icon 1 (*computer slashed-upload*) (M = 5.140, SD = 1.56), Icon 3 (*no computer, slashed-download*) (M = 5.132, SD = 1.46), and Icon 4 (M = 4.755, SD = 1.61). According to Fisher-Hayter tests, both Icon 2 (*computer, slashed-download*) and Icon 1 (*computer slashed-upload*) were significantly greater than Icon 4 (*no computer, crossed-download*), with *p*s < .00001 on attention ratings. Although Icon 3 (*no computer, slashed-download*) was significantly greater than Icon 4 (*no computer, crossed-download*) ($p < .00001$), the attention ratings were equivalent to both Icon 2 (*computer, slashed-download*) and Icon 1 (*computer slashed-upload*), *p*s > .05. There was also no statistically significant difference between Icon 2 (*computer, slashed-download*) and Icon 1 in attention-getting ratings, $p > .05$. Congruent with prior analyses, Icon 2 (*computer, slashed-download*) was considered highest in attention with Icon 4 (*no computer, crossed-download*) being the lowest. The only minor difference, in contrast to the previous findings, was that Icon 1 (*computer, slashed-upload*) surpassed Icon 3 (*no computer, slashed-download*) in terms of attention.

***Compliance.*** As demonstrated in Table 18, there was a statistically significant difference among icons with regard to likelihood of compliance ratings, Mauchly's $W = .546$, $\varepsilon = .805$, $p < .001$, $F(2.416, 526.723) = 18.363$, $p < .01$. Icon 2 (*computer, slashed-download*) (M = 4.962, SD = 1.81) and Icon 3 (*no computer, slashed-download*) (M = 4.897, SD = 1.73) received the highest compliance ratings followed by Icon 1 (*computer slashed-upload*) (M = 4.775, SD = 1.85) and Icon 4 (*no computer, crossed-download*) (M = 4.597, SD = 1.82), respectively. Fisher-Hayter tests indicated that Icon 2 (*computer, slashed-download*), Icon 3 (*no computer, slashed-download*) ($p < .00001$) and Icon 1 (*computer slashed-upload*) ($p < .006$) had significantly higher likelihood of compliance ratings than Icon 4 (*no computer, crossed-download*). Although

Icon 1 (*computer slashed-upload*) was significantly lower than Icon 2 (*computer, slashed-download*) ($p < .004$), it was equivalent to Icon 3 (*no computer, slashed-download*) ($p > .05$). There was also no statistically significant difference between Icon 3 (*no computer, slashed-download*) and Icon 2 (*computer, slashed-download*). Therefore, Icon 2 (*computer, slashed-download*) and Icon 3 (*no computer, slashed-download*) were greatest in likelihood of compliance ratings with Icon 4 (*no computer, crossed-download*) being the least.

***Representativeness.*** There were statistically significant differences among the icons in representativeness ratings, Mauchly's $W = .520$, $\varepsilon = .805$, $p < .001$, $F(2.289, 499.025) = 24.334$, $p < .01$, as shown in Table 19. The icons from greatest to lowest were Icon 2 (*computer, slashed-download*) (M = 5.258, SD = 1.78), Icon 3 (*no computer, slashed-download*) (M = 5.034, SD = 1.72), Icon 1 (*computer slashed-upload*) (M = 4.809, SD = 1.89) and Icon 4 (M = 4.628, SD = 1.73). Fisher-Hayter range tests indicated that Icon 2 (*computer, slashed-download*) and Icon 3 (*no computer, slashed-download*) were significantly greater than both Icon 1 ($p < .00001$, $p < .03$) and Icon 4 (*no computer, crossed-download*) ($p < .00001$ and $p < .00002$ respectively). Icon 2 (*computer, slashed-download*) was significantly greater than Icon 3 (*no computer, slashed-download*) ($p < .03$) in representativeness ratings. Icon 2 (*computer, slashed-download*) received statistically significantly highest scores in representativeness over all other icons. Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer slashed-upload*) received statistically significantly lowest scores.

In summary, Icons 2 (*computer, slashed-download*) and 3 (*no computer, slashed-download*) were the highest performers with regards to understandability, carefulness, compliance, and representativeness. The lowest scores across all dependent variables were given consistently to Icon 4 (*no computer, crossed-download*). Due to the exploratory nature of this study, no predictions were made regarding which particular icon among the four that would perform best.

**Signal Words.**

***Understandability.*** There were statistically significant differences among signal words with regard to understandability, Mauchly's $W = .747$, $\varepsilon = .807$, $p = .001$, $F(1.613, 351.678) = 7.295$, $p < .05$, as found in Table 15. In order from highest to lowest understandability ratings the signal words were STOP (M = 5.265, SD = 1.79), IMPORTANT (M = 5.211, SD = 1.77), and NOTICE (M = 5.149, SD = 1.73 STOP had significantly higher understandability ratings than did NOTICE ($p < .0005$). However, IMPORTANT was statistically equivalent to NOTICE and STOP in understandability ratings, *p*s > .05.

***Carefulness.*** A separate repeated measures one-way ANOVA revealed statistically significant differences in carefulness ratings among icons with and without signal words, Mauchly's W = .872, $\varepsilon = .937$, $p < .001$, $F(2.810, 615.478) = 41.985$, $p < .001$, partial $\eta^2 = .161$, observed power = 1.00, MSE = .350). The order of single signal word conditions from highest to lowest, respectively, was STOP (M = 3.125, SD = 1.642), IMPORTANT (M = 2.999, SD = 1.637), NOTICE (M = 2.870, SD = 1.607), and no signal word (M = 2.543, SD = 1.625). Fisher-Hayter tests demonstrated that icons with no signal word had significantly lower carefulness scores than those with any of the signal words tested, *p*s < .00001, as predicted by Hypothesis 1.

There were statistically significant differences among signal words with regard to carefulness ratings, Mauchly's $W = .904$, $\varepsilon = .924$, $p < .001$, $F(1.848, 402.954) = 11.077$, $p < .01$ as provided in Table 16. With respect to carefulness, the order of signal words from highest to lowest were STOP (M = 5.185, SD = 1.65), IMPORTANT (M = 5.144, SD = 1.63), and

NOTICE (M = 5.056, SD = 1.63). STOP and IMPORTANT were rated significantly higher in carefulness than NOTICE ($p < .0001$, $p < .002$). Once again, there was no statistically significant difference between STOP and IMPORTANT ($p > .05$) in carefulness ratings. The order of the signal words from lowest to highest was consistent with Hypothesis 2, which also predicted that NOTICE would be rated significantly lower in carefulness than STOP.

***Attention.*** Similar to carefulness rating findings, respondents rated icons with no signal words significantly lower than those with a signal word only, Mauchly's $W = .859$, $\varepsilon = .907$, $p < .001$, $F(2.720, 595.660) = 61.313$, $p < .001$, partial $\eta^2 = .219$, observed power = 1.00, MSE = .416. The order of signal words from highest to lowest, respectively was STOP (M = 3.527, SD = 1.500), IMPORTANT (M = 3.403, SD = 1.503), NOTICE (M = 3.269, SD = 1.514), and no signal word (M = 2.786, SD = 1.594). Subsequent Fisher-Hayter analysis revealed that icons with no signal word received significantly lower ratings than icons with any of the tested signal words, $p < .00001$, providing additional support to Hypothesis 1.

There were statistically significant differences among signal words with regard to attention ratings, Mauchly's $W = .925$, $\varepsilon = .942$, $p < .001$, $F(1.885, 410.895) = 14.501$, $p < .01$ as shown in Table 17. From highest to lowest the signal words were STOP (M = 5.114, SD = 1.47), IMPORTANT (M = 5.096, SD = 1.47), and NOTICE (M = 4.974, SD = 1.48). STOP and IMPORTANT were significantly greater in attention ratings than NOTICE (*p*s < .0001). However, there was no statistically significant difference between STOP and IMPORTANT in attention ratings ($p > .05$).

***Compliance.*** There was not a statistically significant difference among signal words, Mauchly's $W = .131$, $\varepsilon = .458$, $p < .001$, $F(1.665, 363.032) = 3.614$, $p > .05$ with regard to compliance ratings as illustrated in Table 18. From highest to lowest the means were STOP (M = 4.843, SD = 1.76), IMPORTANT (M = 4.822, SD = 1.77), and NOTICE (M = 4.759, SD = 1.74).

***Representativeness.*** However, there were statistically significant differences in representativeness ratings among signal words, Mauchly's $W = .929$, $\varepsilon = .945$, and $p < .001$, $F(1.891, 412.203) = 13.187$, $p < .01$ as revealed in Table 19. From highest to lowest in representativeness ratings the signal words were STOP (M = 4.972, SD = 1.66), IMPORTANT (M = 4.970, SD = 1.66), and NOTICE (M = 4.854, SD = 1.62). Fisher-Hayter results indicated that STOP and IMPORTANT were statistically equivalent with each <u>other</u> ($p > .05$), but both were greater than NOTICE ($p < .00001$ and $p < .00002$) in representativeness ratings.

Therefore, icons accompanied with the signal words STOP and IMPORTANT were generally found to be the most effective in increasing carefulness, attention, and representativeness. Understandability was largely improved when the word STOP was included over NOTICE. But, the nonsignificant differences among the three signal words indicated that this was not the case for perceived compliance.

**Messages.**

***Understandability.*** As shown in Table 15, there was a statistically significant difference among messages with regard to understandability ratings, Mauchly's $W = .074$, $\varepsilon = .415$, $p < .001$, $F(1.659, 361.555) = 206.277$, $p < .01$. The order of understandability ratings from highest to lowest were Message 5 (*You may be monitored and fined*; M = 6.048, SD = 2.08), Message 4 (*You may be monitored*; M = 5.592, SD = 1.92), Message 3 (*You may be fined*; M = 5.576, SD = 1.95), Message 2 (*This is illegal*; M = 4.991, SD = 1.83), and Message 1 (signal word only; M =

3.833, SD = 1.78). Fisher-Hayter range tests indicated that all messages were statistically significantly greater in understandability than the control (signal word only), *ps* < .0001. Similarly, Message 2 (*This is illegal.*) received significantly lower understandability scores than all other messages except for the control, (*ps* < .0001). Message 5 (*This is illegal. You may be monitored and fined*) was significantly greater in understandability ratings than Message 3 (*This is illegal. You may be fined*; *p* < .002) and Message 4 (*This is illegal. You may be monitored*; *p* < .003). However, there was no statistically significant difference between Message 3 (*This is illegal. You may be fined*.) and Message 4 (*This is illegal. You may be monitored*.), *p* > .05.

***Carefulness.*** Statistically significant differences among messages were found with regards to carefulness ratings, Mauchly's $W = .131$, $p < .001$, $\varepsilon = .472$, $F(1.887, 411.391) = 371.066$, $p < .01$ as provided in Table 16. Fisher-Hayter tests revealed Message 5 (*This is illegal. You may be monitored and fined*; M = 6.502, SD = 2.02) was significantly higher in carefulness ratings than Message 1 (signal word only; M = 3.018, SD =1.62), Message 2 (*This is illegal*; M = 4.549, SD = 1.88), Message 4 (*This is illegal. You may be monitored*, M = 5.722, SD = 1.90), and Message 3 (*This is illegal. You may be fined*, M = 5.851, SD = 1.93), *p*s < .00001. Message 3 (*This is illegal. You may be fined.*) was significantly higher than Message 1 (signal word only) and Message 2 (*This is illegal.*) with *p*s < .00001, but was statistically equivalent to Message 4 (*This is illegal. You may be monitored), p* > .05 in carefulness ratings. Message 4 (*This is illegal. You may be monitored.*) was significantly higher than Message 1 (signal word only) and Message 2 (*This is illegal*), *p*s < .00001. Likewise, Message 2 (*This is illegal*) was significantly higher than Message 1 (signal word only), *p* < .00001. Thus, the order of message conditions from highest to lowest in carefulness ratings was Message 5 (*This is illegal. You may be monitored and fined*) Message 3 (*This is illegal. You may be fined*), Message

4 (*This is illegal you may be monitored*), Message 2 (*This is illegal*), and Message 1 (signal word only).

***Attention.*** Attention ratings were also significantly different among message conditions, Mauchly's $W = .099$, $\varepsilon = .430$, $p < .001$, $F(1.720, 374.987) = 259.353$, $p < .01$ as illustrated in Table 17. The means in order from highest to lowest were Message 5 (*This is illegal. You may be monitored and fined*; M = 6.184, SD = 1.94), Message 3 (*This is illegal. You may be fined*; M = 5.603, SD = 1.73), Message 4 (*This is illegal. You may be monitored*; M = 5.505, SD = 1.72), Message 2 (*This is illegal*; M = 4.547, SD = 1.59), and Message 1 (signal word only; M = 3.469, SD = 1.47). Fisher Hayter tests indicated that Message 5 (*This is illegal you may be monitored and fined*) was significantly higher in attention ratings than Message 1 (just signal word), Message 2 (*This is illegal*) and Message 4 (*This is illegal. You may be monitored.*), with *p*s < .00001, and Message 3 (*This is illegal. You may be fined*.), $p < .0002$. Although Message 3 (*This is illegal. You may be fined*.) was significantly higher than both Message 1 (just signal word) and Message 2 (*This is illegal.*) with *p*s < .00001, it was statistically equivalent with Message 4 (*This is illegal. You may be monitored*), $p > .05$. Message 4 (*This is illegal. You may be monitored.*) was significantly higher in attention ratings than Message 1 (just signal word) and Message 2 (*This is illegal*.). In addition, Message 2 (*This is illegal.*) was significantly higher in attention ratings than Message 1 (signal word only), $p < .00001$. Lower attention ratings observed in icons with just signal words versus those with all message conditions align with Hypothesis 3 predictions. Fisher Hayter analyses also indicate that the inclusion of consequences resulted to higher attention ratings than messages with only a signal word and/or a statement conveying illegality; thus, supporting Hypothesis 4.

***Compliance.*** Statistically significant differences were also found among messages in terms of compliance ratings, Mauchly's $W = .131$, $\varepsilon = .458$, $p < .001$, $F(1.831, 399.264) = 364.686$, $p < .01$ as found in Table 18. The means from highest to lowest were Message 5 (*This is illegal you may be monitored and fined*; M = 6.114, SD = 2.18), Message 3 (*This is illegal. You may be fined;* M = 5.513, SD = 2.06), Message 4 (*This is illegal. You may be monitored*; M = 5.348, SD = 2.04), Message 2 (*This is illegal*; M = 4.219, SD = 1.88), and Message 1 (signal word only; M = 2.845, SD = 1.57). Fisher-Hayter analyses revealed that Message 5 (*This is illegal. You may be monitored and fined.*) was significantly higher than all other tested message conditions (Messages 1, 2, and 4, with *p*s < .00001, and Message 3 with $p < .0001$). Message 3 (*This is illegal. You may be fined.*) and Message 4 (*This is illegal. You may be monitored*.) were significantly higher in compliance ratings than Message 1 (signal word only) and Message 2 (*This is illegal.*), with *p*s < .00001). Message 3 (*This is illegal. You may be fined.*) was statistically equivalent with Message 4 (*This is illegal. You may be monitored.*), $p > .05$. Message 2 (*This is illegal*.) was significantly higher in compliance scores than Message 1 (signal word only), $p < .00001$. Thus, the prediction that participants will issue high compliance ratings to icons with warning messages, such as those signifying illegality, relative to those only indicating a signal word were further supported by these results (Hypothesis 3). In addition, higher compliance ratings observed in icons with consequences agreed with Hypothesis 4. Contrary to predictions in Hypothesis 5, respondents did not report that they would likely comply with messages relaying the possibility of being fined more than being monitored.

***Representativeness.*** Similar to the other dependent variables, there were statistically significant differences in representativeness scores among message conditions, Mauchly's $W = .080$, $\varepsilon = .410$, $p < .001$, $F(1.640, 357.584) = 236.598$, $p < .01$ as indicated in Table 19. The means and standard deviations from highest to lowest were Message 5 (*This is illegal you may be monitored and fined*, M = 5.903, SD = 2.08), Message 3 (*This is illegal. You may be fined*; M = 5.383, SD = 1.86), Message 4 (*This is illegal. You may be monitored*, M = 5.334, SD = 1.86), Message 2 (*This is illegal;* M = 4.554, SD = 1.64), and Message 1 (signal word only; M = 3.487, SD = 1.62). Message 5 (*This is illegal you may be monitored and fined*) was significantly higher in representativeness ratings than Message 1 (just signal word), Message 2 (*This is illegal.*), with *p*s < .00001, Message 3 (*This is illegal. You may be fined.*), $p < .0005$, and Message 4 (*This is illegal. You may be monitored.*), $p < .00006$. Message 3 (*This is illegal. You may be fined*.) and Message 4 (*This is illegal. You may be monitored*.) were significantly higher in representativeness ratings than Message 1 (signal word only) and Message 2 (*This is illegal*.), *p*s < .00001. Message 3 (*This is illegal. You may be fined.*) was statistically equivalent with Message 4 (*This is illegal. You may be monitored*.), $p > .05$. Furthermore, Message 1 (signal word only) received lower representativeness ratings than with Message 2 (*This is illegal*.), $p < .00001$.

Hence, the varieties of messages tested from signal word only to statements concerning consequences were tested under each dependent variable: *understandability*, *carefulness*, *attention*, *compliance*, and *representative*. All measures yielded identical results. The message containing all consequences of being monitored and fined was rated highest in all dimensions. Those icons containing only the signal words were rated lowest in all measured variables. Moreover, contrary to expectations, messages that only indicated being monitored or being fined were equivalent with regards to compliance and attention-getting ratings.

**Icon x Message.**

***Attention.*** There was a statistically significant icon x message interaction, Mauchly's $W = .498$, $p < .001$, $\varepsilon = .953$, $F(11.431, 2492.016) = 2.848$, $p < .01$, partial $\eta^2 = .013$, observed power = .987, with regards to attention ratings as viewed in Table 17.

*Message 1 (signal word only).* As depicted in Figure 22, tests for simple effects found statistically significant differences among tested icons under Message 1 (signal word only), $F(3, 2492) = 17.378$, $p < .0001$. Fisher-Hayter range tests demonstrated that Icon 2 (*computer, slashed-download*) (M = 3.639, SD = 1.65), was significantly higher than Icon 4 (*no computer, crossed-download*) (M = 3.234, SD = 1.58), $p < .00001$, and Icon 1(*computer slashed-upload*) (M = 3.468, SD = 1.58), $p < .007$. Icon 3 (*no computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p < .00001$, but statistically equivalent to Icon 1 (*computer slashed-upload*) $p > .05$. Icon 1 (*computer slashed-upload*) was significantly greater than Icon 4 (*no computer, crossed-download*) ($p < .00001$) in attention ratings. Thus, when there is only a signal word and icon (control), Icons 2 (*computer, slashed-download*) and Icons 3 (*no computer, slashed-download*) performed the best and Icon 4 (*no computer, crossed-download*) performed the worst on attention ratings.

*Message 2 (This is illegal).* There were also statistically significant differences in attention ratings among icons under Message 2 (*This is illegal*.), $F(3, 2492) = 22.114$, $p < .0001$. Under this condition, Fisher-Hayter range tests showed that Icon 2 (*computer, slashed-download*) (M = 4.695, SD = 1.68) scored highest, followed by Icon 1 (*computer slashed-upload*) (M = 4.681, SD = 1.81), Icon 3 (*no computer, slashed-download*) (M = 4.534, SD = 1.68), and Icon 4 (*no computer, crossed-download*) (M = 4.277, SD = 1.76). Icon 2 (*computer, slashed-download*) and Icon 1 (*computer slashed-upload*) were significantly higher than Icon 4 (*no computer, crossed-download*), *p*s < .00001, and Icon 3 (*no computer, slashed-download*) (*p* < .02, *p* < .03, respectively) on attention ratings. However, there was no statistically significant difference in attention ratings between Icon 2 (*computer, slashed-download*) and Icon 1 (*computer slashed-upload*), *p* > .05. Furthermore, Icon 3 (*no computer, slashed-download*) was significantly higher in attention ratings than Icon 4 (*no computer, crossed-download*), *p* < .00001. Hence, Icon 2 (*computer, slashed-download*) had the highest attention ratings whereas Icon 4 (*no computer, crossed-download*) was the lowest.

*Message 3 (This is illegal. You may be fined.)* Statistically significant differences in attention ratings were obtained for Message 3 across icon (*This is illegal. You may be fined.*), $F(3, 2492) = 21.527$, $p < .0001$. The means from highest to lowest were Icon 3 (*no computer, slashed-download*) (M = 5.720, SD = 1.80), Fisher-Hayter range tests indicated that Icon 2 (*computer, slashed-download*) (M = 5.711, SD = 1.86), Icon 1 (*computer slashed-upload*) (M = 5.661, SD = 1.88) and Icon 4 (*no computer, crossed-download*) (M = 5.318, SD = 1.95). Icon 3 (*no computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*) (*p* < .00001), but was statistically equivalent to both Icon 1 (*computer slashed-upload*) and Icon 2 (*computer, slashed-download*), with *p*s > .05. Icon 2 (*computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*), *p* < .00001, but statistically equivalent to Icon 1 (*computer slashed-upload*), *p* > .05. Furthermore, Icon 1 (*computer slashed-upload*) was significantly higher than Icon 4 (*no computer, crossed-download*), *p* < .00001 on attention ratings. Thus, Icon 3 (*no computer, slashed-download*) was found to have the highest salience ratings among all other icons under Message 3 (*This is illegal. You may be fined.*), whereas Icon 4 (*no computer, crossed-download*) had the lowest.

*Message 4 (This is illegal. You may be monitored).* Under Message 4 (*This is illegal. You may be monitored*) statistically significant differences were found among icons, $F(3, 2492) = 23.064$, $p < .0001$. The means from highest to lowest were Icon 2 (*computer, slashed-download*) (M = 5.619, SD = 1.90), Icon 1(*computer slashed-upload*) (M = 5.599, SD = 1.89), Icon 3 (M = 5.593, SD = 1.74), and Icon 4 (M = 5.208, SD = 1.93). According to Fisher-Hayter analyses, Icon 2 (*computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p < .00001$, but differed non-significantly with Icon 3 (*no computer, slashed-download*) and Icon 1 (*computer slashed-upload*), *ps* > .05. Icon 1 (*computer slashed-upload*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p < .00001$, but not significantly different from Icon 3 (*no computer, slashed-download*) on attention ratings. Furthermore, Icon 3 (*no computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p < .00001$. Thus, as in the aforementioned results, Icon 4 (*no computer, crossed-download*) received the lowest ratings in terms of salience under the message, "*This is illegal. You may be monitored*". However, similar to the control, Message 1, and Message 2, Icon 2 (*computer, slashed-download*) had the highest attention ratings, whereas Icon 4 (*no computer, crossed-download*), once again, had the lowest.

*Message 5 (This is illegal. You may be monitored and fined.).* Statistically significant differences among icons were also observed under Message 5 (*This is illegal. You may be monitored and fined.*), $F(3, 2492) = 54.458$, $p < .0001$. The means for each of the icons from highest to lowest were Icon 2 (*computer, slashed-download*) (M = 6.429, SD = 2.04), Icon 1 (*computer slashed-upload*) (M = 6.289, M = 2.14), Icon 3 (*no computer, slashed-download*) (M = 6.279, SD = 1.99), and Icon 4 (*no computer, crossed-download*) (M = 5.739, SD = 2.15). Subsequent Fisher-Hayter range tests indicated that Icon 2 (*computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*) ($p$ < .00001), Icon 3 (*no computer, slashed-download*) ($p$ < .03), and Icon 1(*computer slashed-upload*) ($p$ < .04) in attention ratings. Icon 1 (*computer slashed-upload*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p$ < .00001, but statistically equivalent with Icon 3 (*no computer, slashed-download*), $p$ > .05. Furthermore, Icon 3 (*no computer, slashed-download*) was significantly higher than Icon 4 (*no computer, crossed-download*), $p$ < .00001 in attention ratings. Similar to the aforementioned findings, Icon 2 (*computer, slashed-download*) was rated the highest whereas Icon 4 (*no computer, crossed-download*) was the lowest in attention ratings.

*Icon 1 (computer slashed-upload).* Tests of simple effects found statistically significant differences in message within Icon 1 (*computer slashed-upload*) [$F(4, 2492) = 706.207$, $p$ < .0001]. Subsequent Fisher-Hayter tests revealed that there were statistically significant differences among the following messages from greatest to least: Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.289, SD = 2.14), Message 3 (*This is illegal. You may be fined.*) (M = 5.661, SD = 1.88), Message 4 (*This is illegal. You may be monitored.*) (M = 5.599, SD = 1.89), Message 2 (*This is illegal*.) (M = 4.681, SD = 1.81), and Message 1 (signal word only) (M = 3.468, SD = 1.58). All pairwise comparisons were statistically significant with *p*s < .00001, with exception with the Message 3 and Message 4, with $p$ > .05. Message 5 (*This is illegal. You may be monitored and fined*) had the highest attention ratings, whereas Message 1 (signal word only) had the lowest. This general pattern emerged under all icons.

*Icon 2 (computer, slashed-download).* Statistically significant differences were found within Icon 2 (*computer, slashed-download*) [$F(4, 2492) = 681.030$, $p$ < .0001]. The means and standard deviations in order from highest to lowest attention-getting ratings are Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.429, SD = 2.04), Message 3 (*This is illegal.*

*You may be fined.*) (M = 5.711, SD = 1.86), Message 4 (*This is illegal. You may be monitored.*) (M = 5.619, SD = 1.90), Message 2 (*This is illegal*.) (M = 4.695, SD = 1.68), and Message 1 (signal word only) (M = 3.639, SD = 1.65). All pairwise comparisons were statistically significant, with *p*s < .00001, with exception with the Message 3 and Message 4, which was significant with *p* < .0007.

*Icon 3 (no computer, slashed-download).* Messages within Icon 3 (*no computer, slashed-download*) differed significantly with regard to attention ratings [$F(4, 2492) = 701.347$, $p < .0001$]. The means were as follows: Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.279, SD = 1.99), Message 3 (*This is illegal. You may be fined.*) (M = 5.720, SD = 1.80), Message 4 (*This is illegal. You may be monitored.*) (M = 5.593, SD = 1.74), Message 2 (*This is illegal*.) (M = 4.534, SD = 1.68), and Message 1 (signal word only) (M = 3.537, SD = 1.62). All pairwise comparisons were statistically significant, with *p*s < .00001.

*Icon 4 (no computer, crossed-download).* There were statistically significant differences in attention ratings under Icon 4 (*no computer, crossed-download*) [$F(4, 2492) = 529.209 = p < .0001$]: Message 5 (*This is illegal. You may be monitored and fined*) (M = 5.739, SD = 2.15), Message 3 (*This is illegal. You may be fined.*) (M = 5.318, SD = 1.95), Message 4 (*This is illegal. You may be monitored.*) (M = 5.208, SD = 1.93), Message 2 (*This is illegal*.) (M = 4.277, SD = 1.76), and Message 1 (signal word only) (M = 3.234, SD = 1.58). All pairwise comparisons were statistically significant, with *p*s < .00001.

Thus, as shown in Figure 22, Icon 2 (*computer, slashed-download*) tended to have the highest attention ratings whereas Icon 4 (*no computer, crossed-download*) generally underperformed in attention ratings across all message conditions. There were marginal differences between Icons 2 (*computer, slashed-download*) and 3 (*no computer, slashed-download*) in attention ratings. Moreover, across all icons, Message 5 (*This is illegal. You may be monitored and fined.*) had the highest attention ratings, whereas Message 1 (signal word only) had the lowest. There was little difference between the attention ratings of Message 3 and Message 4 across icons. Therefore, it appeared that as the warning became more explicit, there were higher attention ratings. Hence, Icon 2 (*computer, slashed-download*) coupled with Message 5 (*This is illegal. You may be monitored and fined.*) yielded the highest attention ratings.

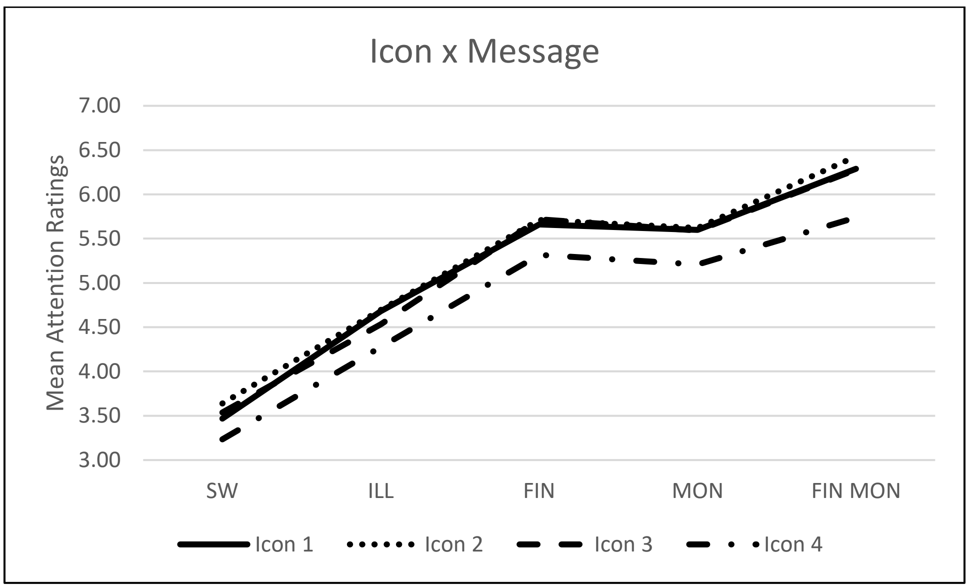



Figure 22. Mean attention ratings as a function of icon and message. SW (Signal Word), ILL (This is illegal.), FIN (This is illegal. You may be fined.), MON (This is illegal. You may be monitored.), FIN MON (This is illegal. You may be monitored and fined.)

***Compliance.*** As indicated in Table 18 and in Figure 23, there was a statistically significant icon x message interaction on compliance ratings, Mauchly's W = .421, $p < .001$, $\varepsilon = .919$, $F(11.022, 2403) = 3.127$, $p < .01$, partial $\eta 2 = .014$, observed power = .992. Tests of simple effects followed by Fisher-Hayter range tests were conducted.

*Message 1 (signal word only).* There were statistically significant differences among the icons for Message 1 (signal word only), $F(3, 2403) = 8.419$, $p < .0001$. The means from greatest to least were Icon 2 *(computer, slashed download)* (M = 3.003, SD = 1.74), Icon 3 *(no computer, slashed-download)* (M = 2.873, SD = 1.64), Icon 1 (M = 2.757, SD = 1.60), and Icon 4 (*no computer, crossed-download*) (M = 2.747, SD = 1.67). According to Fisher-Hayter analyses, Icon 2 *(computer, slashed download)* was significantly higher in compliance ratings than both Icon 1 (*computer, slashed-upload*) and Icon 4 (*no computer, crossed-download*), $p < .00001$, but statistically equivalent to Icon 3, $p > .05$. Icon 3 *(no computer, slashed-download)* was not significantly greater in compliance ratings than either Icon 4 (*no computer, crossed-download*) or Icon 1 (*computer, slashed-upload*), *ps* > .05. In addition, no statistically significant difference was found between Icon 1 (*computer, slashed-upload*) and Icon 4 (*no computer, crossed-download*), $p > .05$.

*Message 2 (This is illegal).* For Message 2 (*This is illegal.*), the test of simple effects was statistically significant across icons, $F(3, 2403) = 8.059$, $p < .0001$. The means of the icons from greatest to least were Icon 3 (M = 4.330, SD = 1.94), Icon 2 (M =4.301, SD = 2.02), Icon 1 (*computer, slashed-upload*) (M = 4.168, SD = 1.97), and Icon 4 (*no computer, crossed-download*) (M = 4.079, SD = 2.00). Icon 3 *(no computer, slashed-download)* was significantly higher in compliance ratings than both Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*), with $p < .00001$ and $p < .02$, respectively. Furthermore, pairwise comparison analyses also revealed that Icon 2 *(computer, slashed download)* was greater than Icon 4 (*no computer, crossed-download*), $p < .0002$, but not greater than Icon 1 (*computer, slashed-upload*), $p > .05$. Icon 3 *(no computer, slashed-download)* was statistically equivalent to Icon 2 *(computer, slashed download)*, $p > .05$ and there was no statistically significant difference between Icon 1 (*computer, slashed-upload*) and Icon 4 (*no computer, crossed-download*), $p > .05$ in compliance ratings.

*Message 3 (This is illegal. You may be fined).* Under Message 3 (*This is illegal. You may be fined*) statistically significant findings were found across icons, $F(3, 2403) = 25.615$, $p < .0001$. The order of icons from highest to lowest means were Icon 2 (*computer, slashed download*) (M = 5.685, SD = 2.15), Icon 3 *(no computer, slashed-download)* (M = 5.622, SD = 2.12), Icon 1(*computer, slashed-upload*) (M = 5.529, SD = 2.24), and Icon 4 (M = 5.214, SD = 2.19). Icon 2 (*computer, slashed download*) was significantly higher in compliance ratings than both Icon 4 (*no computer, crossed-download*) ($p < .00001$) and Icon 1(*computer, slashed-upload*) ($p < .02$), but not Icon 3 *(no computer, slashed-download)*, $p > .05$. In addition, Icon 3 *(no computer, slashed-download)* was significantly higher than Icon 4 (*no computer, crossed-download*) ($p < .00001$), but not Icon 1 (*computer, slashed-upload*), $p > .05$. Finally, Icon 1 (*computer, slashed-upload*) was significantly higher in compliance ratings than Icon 4 (*no computer, crossed-download*), $p < .00001$.

*Message 4 (This is illegal. You may be monitored).* There was a statistically significant difference in compliance ratings among icons under Message 4 (*This is illegal. You may be monitored.*), $F(3, 2403) = 11.836$, $p < .01$. The order of icons from highest to lowest means in compliance ratings were Icon 2 *(computer, slashed download)* (M = 5.475, SD = 2.14), Icon 3 *(no computer, slashed-download)* (M = 5.431, SD = 2.09), Icon 1 (M = 5.330, SD = 2.25), and Icon 4 (*no computer, crossed-download*) (M = 5.155, SD = 2.11). Icon 2 *(computer, slashed download)* was significantly higher in compliance ratings than both Icon 4 (*no computer, crossed-download*) ($p < .00001$), and Icon 1 (*computer, slashed-upload*) ($p < .04$), but not with Icon 3 *(no computer, slashed-download)*, $p > .05$. Icons 3 *(no computer, slashed-download)* and

1 (*computer, slashed-upload*) were significantly greater in compliance ratings than Icon 4 (*no computer, crossed-download*), $p < .00001$ and $p < .007$.

*Message 5 (This is illegal. You may be monitored and fined.).* Once again, there was a statistically significant difference in compliance ratings among icons with regards to Message 5 (*This is illegal. You may be monitored and fined.*), $F(3, 2403) = 33.835$, $p < .001$. The icons from highest to lowest means in compliance were Icon 2 *(computer, slashed download)* (M = 6.346, SD = 2.31), Icon 3 *(no computer, slashed-download)* (M = 6.229, SD = 2.20), Icon 1(*computer, slashed-upload*) (M = 6.092, SD = 2.42), and Icon 4 (*no computer, crossed-download*) (M = 5.789, SD = 2.32). Icon 2 *(computer, slashed download)* was significantly higher than both Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*), $p < .00001$, but not significantly different from Icon 3 *(no computer, slashed-download)*, $p > .05$. Icon 3 *(no computer, slashed-download)* was also significantly greater than Icon 4 (*no computer, crossed-download*) ($p < .00001$), and Icon 1 (*computer, slashed-upload*) ($p < .05$). Furthermore, Icon 1 (*computer, slashed-upload*) was significantly higher in compliance ratings than Icon 4 (*no computer, crossed-download*), $p < .00001$.

*Icon 1 (computer, slashed-upload).* Tests of simple effects additionally found statistically significant differences across messages within Icon 1 (*computer, slashed-upload*) [$F(4, 2403) = 1033.257$, $p < .001$]. The order of compliance ratings from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.092, SD = 2.42), Message 3 (*This is illegal. You may be fined*) (M = 5.529, SD = 2.24), Message 4 (*This is illegal. You may be monitored*) (M = 5.330, SD = 2.25), Message 2 (*This is illegal*.) (M = 4.168, SD = 1.97), and Message 1 (signal word only) (M = 2.757, SD = 1.60). All pairwise comparisons were statistically significant with *p*s < .00001.

*Icon 2 (computer, slashed download).* Tests of simple effects revealed statistically significant differences across messages within Icon 2 *(computer, slashed download)* [$F(4, 2403) = 1022.142$, $p < .0001$]. The order of compliance ratings from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.346, SD = 2.31), Message 3 (*This is illegal. You may be fined*) (M = 5.685, SD = 2.15), Message 4 (*This is illegal. You may be monitored*) (M = 5.475, SD = 2.14), Message 2 (*This is illegal.*) (M = 4.301, SD = 2.02), and Message 1 (signal word only) (M = 3.003, SD =1.74). All pairwise comparisons were statistically significant with *p*s < .00001.

*Icon 3 (no computer, slashed-download).* Tests of simple effects additionally found statistically significant differences across messages within Icon 3 *(no computer, slashed-download)* [$F(4, 2403) = 1026.116$, $p < .001$]. The order of compliance ratings from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.229, SD = 2.20), Message 3 (*This is illegal. You may be fined*) (M = 5.622, SD = 2.12), Message 4 (*This is illegal. You may be monitored*) (M = 5.431, SD = 2.09), Message 2 (*This is illegal.*) (M = 4.330, SD = 1.94), and Message 1 (signal word only) (M = 2.873, SD = 1.64). All pairwise comparisons were statistically significant with *p*s < .00001.

*Icon 4 (no computer, crossed-download).* Tests of simple effects additionally found statistically significant differences across messages within Icon 4 (*no computer, crossed-download*), [$F(4, 2403) = 850.385$, $p < .001$]. The order of compliance ratings from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*) (M = 5.789, SD = 2.32), Message 3 (*This is illegal. You may be fined*) (M = 5.214, SD = 2.19), Message 4 (*This is illegal. You may be monitored*) (M = 5.155, SD = 2.11), Message 2 (*This is illegal.*) (M = 4.079, SD = 2.00), and Message 1 (signal word only) (M = 2.747, SD = 1.67). All pairwise comparisons were statistically significant, *p*s < .00001, except Message 3 and Message 4, *p* > .05.

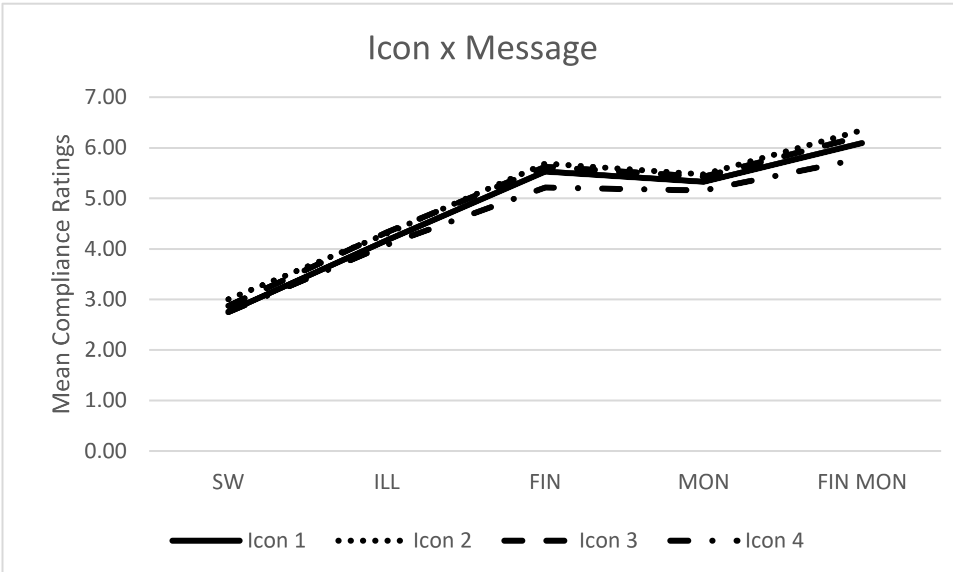



Figure 23. Mean compliance ratings as a function of icon and message. SW (Signal Word), ILL (This is illegal.), FIN (This is illegal. You may be fined.), MON (This is illegal. You may be monitored.), FIN MON (This is illegal. You may be monitored and fined.)

In summary, under each icon, the order of compliance from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*), Message 3 (*This is illegal. You may be fined*), Message 4 (*This is illegal. You may be monitored*), Message 2 (*This is illegal*), and Message 1 (signal word only). There were differences between Message 3 and Message 4 under various icons. Respondents notably viewed icons associated with being fined as more compliance inducing than those related with being monitored in only the top performing icons. This distinction was not apparent under icon 4, which consistently received the lowest scores across all measured dimensions. In general, Icons 2 *(computer, slashed-download)* and 3 *(no computer, slashed-download)* had significantly higher compliance ratings than Icons 1 (*computer, slashed-upload*) and 4 *no computer, crossed-download*). Similar to attention ratings, Icon 2 (*computer, slashed-download*) coupled with Message 5 (*This is illegal. You may be monitored and fined.*) provided the highest compliance ratings.

***Representativeness.*** As shown in Table 19 and Figure 23, there was a statistically significant icon x message interaction for representativeness ratings, Mauchly's W = .435, $p <$ .001, $\varepsilon = .939$, $F(11.267, 2456) = 3.085$, $p < .01$, partial $\eta 2 = .014$, observed power =.992. Simple effects analyses were followed by Fisher-Hayter tests to identify statistically significant pairwise comparisons.

*Message 1 (only signal word).* The simple effects test revealed statistically significant differences among the icons for Message 1 (only signal word), $F(3, 2456) = 19.324$, $p < .001$. The icons from highest to lowest representative means were Icon 2 (*computer, slashed download*) (M = 3.702, SD = 1.79), Icon 3 *(no computer, slashed-download)* (M = 3.553, SD = 1.76), Icon 1 (*computer, slashed-upload*) (M = 3.409, SD = 1.82), and Icon 4 (*no computer, crossed-download*) (M = 3.286, SD = 1.68). Subsequent Fisher-Hayter tests indicated that Icon 2 (*computer, slashed download*) and Icon 3 *(no computer, slashed-download)* had significantly higher representative ratings than Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*), *p*s < .00001. Moreover, Icon 2 (*computer, slashed download*) had significantly higher ratings than Icon 3 *(no computer, slashed-download)*, $p < .03$. Icons 1 (*computer, slashed-upload*) and 4 (*no computer, crossed-download*) scored the least in representativeness and were not significantly different from each other, $p > .05$.

*Message 2 (This is illegal).* Statistically significant differences among the icons in representative ratings were obtained for Message 2 (*This is illegal)* $F(3, 2456) = 39.309$, $p <$ .001. The icons from greatest to lowest representative means were Icon 2 (*computer, slashed* *download*) (M = 4.890, SD = 1.86), Icon 3 *(no computer, slashed-download)* (M = 4.598, SD = 1.75), Icon 1 (*computer, slashed-upload*) (M = 4.438, SD = 1.92) and Icon 4 (*no computer, crossed-download*) (M = 4.291, SD = 1.78). Icon 2 (computer, slashed download) was significantly higher in representativeness than Icon 4 (*no computer, crossed-download*), Icon 1 (*computer, slashed-upload*), and Icon 3 *(no computer, slashed-download)*, *p*s < .00001. Icon 3 *(no computer, slashed-download)* was also significantly higher in representativeness ratings than Icon 4 (*no computer, crossed-download*), *p* < .00001, and Icon 1 (*computer, slashed-upload*), *p* < .02. In addition, Icon 1 (*computer, slashed-upload*) was significantly higher than Icon 4 (*no computer, crossed-download*), *p* < .03.

*Message 3 (This is illegal. You may be monitored).* There was a statistically significant difference among the icons for Message 3 (*This is illegal. You may be monitored*), *F*(3, 2456) = 47.580, *p* < .001. The icons from highest to lowest representativeness means were Icon 2 (*computer, slashed download*) (M = 5.689, SD = 2.03), Icon 3 (*no computer, slashed-download*) (M = 5.534, SD = 1.99), Icon 1 (*computer, slashed-upload*) (M = 5.248, SD = 2.21), and Icon 4 (M = 5.060, SD = 2.03). Icons 2 (*computer, slashed-download*) and 3 (*no computer, slashed-download*) were significantly higher on representativeness ratings than Icon 4 (*no computer, crossed-download*), Icon 1 (*computer, slashed-upload*), *p*s < .00001, with Icon 2 (*computer, slashed download*) being significantly higher than Icon 3 (*no computer, slashed-download*), *p* < .02. In addition, Icon 1 (*computer, slashed-upload*) was significantly greater than Icon 4 (*no computer, crossed-download*), *p* < .003.

*Message 4 (This is illegal. You may be fined*). For Message 4 (*This is illegal. You may be fined*), statistically significant differences existed among the icons, *F*(3, 2456) = 50.177, *p* < .001. The icons from highest to lowest representative means were Icon 2 (*computer, slashed* *download*) (M = 5.658, SD = 2.08), Icon 3 (*no computer, slashed-download*) (M = 5.468, SD = 1.99), Icon 1 (*computer, slashed-upload*) (M = 5.215, SD = 2.16), and Icon 4 (*no computer, crossed-download*) (M = 4.995, SD = 1.96). Icons 2 (*computer, slashed-download*) and 3 (*no computer, slashed-download*) were significantly higher on representativeness ratings than Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*), *p*s < .00001, with Icon 2 (*computer, slashed-download*) being significantly higher than Icon 3 (*no computer, slashed-download*), *p* < .003. Icon 3 (*no computer, slashed-download*) was significantly higher in representativeness ratings than Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*), *p*s < .00001. Icon 1 (*computer, slashed-upload*) was also found to be significantly higher than Icon 4 (*no computer, crossed-download*), *p* < .00001.

*Message 5 (This is illegal. You may be monitored and fined).* Under Message 5 (*This is illegal. You may be monitored and fined*) statistically significant differences were obtained among the icons in representativeness ratings, F(3, 2456) = 79.254, p < .001. The icons from highest to lowest in means were Icon 2 (*computer, slashed-download*) (M = 6.351, SD = 2.28), Icon 3 (*no computer, slashed-download*) (M = 6.019, SD = 2.23), Icon 1 (*computer, slashed-upload*) (M = 5.736, SD = 2.45), and Icon 4 (*no computer, crossed-download*) (M = 5.508, SD = 2.23). Icons 2 (*computer, slashed-download*) and 3 (*no computer, slashed-download*) were significantly higher in representative ratings than Icon 4 (*no computer, crossed-download*) and Icon 1 (*computer, slashed-upload*). Moreover, Icon 2 (*computer, slashed-download*) was significantly higher than Icon 3 (*no computer, slashed-download*) in representative ratings, *p*s < .00001. Finally, Icon 1 (*computer, slashed-upload*) was significantly greater than Icon 4 (*no computer, crossed-download*), *p* < .00001.

*Icon 1 (computer, slashed-upload).* There was a statistically significant difference among messages with regard to representative ratings for Icon 1 (*computer*, *slashed-upload*), $F(4, 2456) = 494.906$, $p < .001$. The order of messages, in terms of mean representativeness, from highest to lowest was Message 5 (*This is illegal. You may be monitored and fined*) (M = 5.736, SD = 2.45), Message 3 (*This is illegal. You may be monitored*) (M = 5.248, SD = 2.21), Message 4 (*This is illegal. You may be fined*) (M = 5.215, SD = 2.16), Message 2 (*This is illegal*) (M = 4.438, SD = 1.92), and Message 1 (*only signal word*) (M = 3.409, SD = 1.82). All pairwise comparisons were significantly different from each other (*p*s < .00001), except between Message 3 (*This is illegal. You may be monitored*) and Message 4 (*This is illegal. You may be fined*).

*Icon 2 (computer, slashed download).* For Icon 2 (*computer, slashed download*), there was a statistically significant difference among the messages in representativeness ratings, $F(4, 2456) = 611.740$, $p < .001$. The message order and means, from highest to lowest, were Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.351, SD = 2.28), Message 3 (*This is illegal. You may be monitored*) (M = 5.689, SD = 2.03), Message 4 (*This is illegal. You may be fined*) (M = 5.658, SD = 2.08), Message 2 (*This is illegal*) (M = 4.890, SD = 1.86), and Message 1 (only signal word) (M = 3.702, SD = 1.79). All pairwise comparisons were significantly different from each other (*p*s < .00001), except between Message 3 (*This is illegal. You may be monitored*) and Message 4 (*This is illegal. You may be fined*).

*Icon 3 (no computer, slashed-download).* There was a statistically significant difference among messages in representative ratings for Icon 3 (*no computer, slashed-download*) $F(4, 2456) = 566.206$, $p < .001$. The means, from highest to lowest, were Message 5 (*This is illegal. You may be monitored and fined*) (M = 6.019, SD = 2.23), Message 3 (*This is illegal. You may be monitored*) (M = 5.534, SD = 1.99), Message 4 (*This is illegal. You may be fined*) (M =

5.468, SD = 1.99), Message 2 (*This is illegal*) (M = 4.598, SD = 1.75), and Message 1 (only signal word) (M = 3.553, SD = 1.76). All pairwise comparisons were significantly different from each other (ps < .00001), except between Message 3 (*This is illegal. You may be monitored*) and Message 4 (*This is illegal. You may be fined*).

*Icon 4 (no computer, crossed-download).* There was a statistically significant difference among messages in representative ratings for Icon 4 (*no computer, crossed-download*), $F(4, 2456) = 499.475$, $p < .001$. The means, from highest to lowest, were Message 5 (*This is illegal. You may be monitored and fined*) (M = 5.508, SD = 2.23), Message 3 (*This is illegal. You may be monitored*) (M = 5.060, SD = 2.03), Message 4 (*This is illegal. You may be fined*) (M = 4.995, SD = 1.96), Message 2 (*This is illegal*) (M = 4.291, SD = 1.78), and Message 1 (only signal word) (M = 3.286, SD = 1.68). All pairwise comparisons were significantly different from each other (*p*s < .00001), except between Message 3 (*This is illegal. You may be monitored*) and Message 4 (*This is illegal. You may be fined*).

In summary, under all tested message conditions ranging from signal word to the inclusion of both consequences (being fined and monitored), Icon 2 (*computer, slashed download*) consistently received highest ratings in representativeness. Respondents indicated that Icon 4 (*no computer, crossed-download*) was lowest in representativeness under each message condition tested. In corroboration with the previous results, Message 5 (*This is illegal. You may be monitored and fined)* which contains both consequences received highest representativeness ratings. Icon with only a signal word received the lowest ratings. Hence, similar to the results of attention and compliance, Icon 2 (*computer, slashed download*) coupled with Message 5 (*This is illegal. You may be monitored and fined)* received the highest representative ratings.

**Signal Word x Message.**

***Understandability.*** As indicated by Table 15 and Figure 24, there was a statistically significant signal x message interaction with regards to understandability ratings, Mauchly's $W$ = .505, $p < .001$, ε = .870, $F(6.957, 1516) = 4.542$, $p < .01$, partial η2 = .020, observed power = .994.

*Message 1 (only signal word).* Tests of simple effects indicated that there were statistically significant differences in understandability ratings across signal words within Message 1 (only signal word), $F(2, 1517) = 21.714$, $p < .0001$. The signal words from highest to lowest understandability ratings were STOP (M = 4.044, SD = 1.91), IMPORTANT (M = 3.758, SD = 1.91), and NOTICE (M = 3.698, SD = 1.77). STOP was significantly higher than NOTICE and IMPORTANT, *p*s < .00001. However, there was no statistically significant difference between IMPORTANT and NOTICE $p > .05$.

*Message 2 (This is illegal.).* There were no statistically significant differences among signal words in understandability ratings under Message 2 (*This is illegal.*), $F(2, 1517) = 1.795$, $p > .05$. The order of means from highest to lowest was STOP (M = 5.046, SD = 1.94), IMPORTANT (M = 4.986, SD = 1.88), and NOTICE (M = 4.940, SD = 1.88).

*Message 3 (You may be fined).* The same pattern was statistically significant among signal words under Message 3 (*You may be fined*), $F(2, 1517) = 1.367$, $p > .05$. Under this message, IMPORTANT (M = 5.626, SD = 1.96), was followed by STOP (M = 5.570, SD = 2.04), and NOTICE (M = 5.534, SD = 2.01), in order from greatest to least understandability ratings.

*Message 4 (You may be monitored).* There were no statistically significant differences among signal words with regard to Message 4 (*You may be monitored*), $F(2, 1517) = 2.501$, $p > .05$. The order of understandability ratings from highest to lowest were IMPORTANT (M = 5.651, SD = 1.99), followed by STOP (M = 5.599, SD = 1.97), and NOTICE (M = 5.526, SD = 1.94).

*Message 5 (You may be monitored and fined).* Finally, under Message 5 (*You may be monitored and fined*), no statistically significant differences were found among the signal words in terms of understandability ratings, $F(2, 1517) = .150$, $p > .05$. The mean understandability ratings from highest to lowest were STOP (M = 6.064, SD = 2.12), NOTICE (M = 6.047, SD = 2.16), IMPORTANT (M = 6.033, SD = 2.11), *p*s > .05.

*STOP*. There were statistically significant differences among understandability ratings of messages with regards to STOP, $F(4, 1517) = 378.215$, $p < .0001$. The order from greatest to least were Message 5 (*You may be monitored and fined*) (M = 6.064, SD = 2.12), Message 4 (*You may be monitored*) (M = 5.599, SD = 1.97), Message 3 (*You may be fined*) (M = 5.570, SD = 2.04), Message 2 (*This is illegal.*) (M = 5.046, SD = 1.94), and Message 1 (signal word only) (M = 4.044, SD = 1.91). Each of the paired comparisons were statistically significantly different from each other (*p*s < .00001), except with Message 4 (*You may be monitored*) compared to Message 3 (*You may be fined*), $p > .05$.

*IMPORTANT.* There were statistically significant differences among messages with regard to understandability ratings for the signal word IMPORTANT, $F(4, 1517) = 508.670$, $p < .001$. The understandability ratings from greatest to least ratings was Message 5 (*You may be monitored and fined*) (M = 6.033, SD = 2.11), Message 4 (*You may be monitored*) (M = 5.651, SD = 1.99), Message 3 (*You may be fined*) (M = 5.626, SD = 1.96), Message 2 (*This is illegal.*) (M = 4.986, SD = 1.88), and Message 1 (signal word only) (M = 3.758, SD = 1.91). All pairwise comparisons were also statistically significant according to Fisher-Hayter tests with *p*s <.00001. Similar to the previous analysis, Message 3 (*You may be fined*) and Message 4 (*You may be monitored*) were statistically equivalent with each other, $p > .05$.

*NOTICE.* There were statistically significant differences in understandability ratings for NOTICE, $F(4, 1517) = 515.413$ $p < .0001$. The messages from greatest to lowest in understandability were Message 5 (*You may be monitored and fined*) (M = 6.047, SD = 2.16) followed by Message 3 (*You may be fined*) (M = 5.543, SD = 2.01), Message 4 (*You may be monitored*) (M = 5.526, SD = 1.94), Message 2 (*This is illegal.*) (M = 4.940, SD = 1.88), and Message 1 (signal word only) (M = 3.698, SD = 1.77), respectively. Again, all pairwise comparisons via Fisher-Hayter analyses were significantly different from each other, *p*s < .00001. Similar to STOP and IMPORTANT, the only exception was Message 4 (*You may be monitored*) compared to Message 3 (*You may be fined*), $p > .05$.

In summary, in agreement with earlier findings, Message 5 (*You may be monitored and fined*) had the highest understandability ratings regardless of signal word. Icons with the signal word STOP received the highest understandability scores compared with IMPORTANT and NOTICE. However, when paired with the various tested warning messages, signal words were generally equivalent in understandability ratings. Similar to earlier findings, warning messages containing only one consequence were equivalent in understandability ratings.

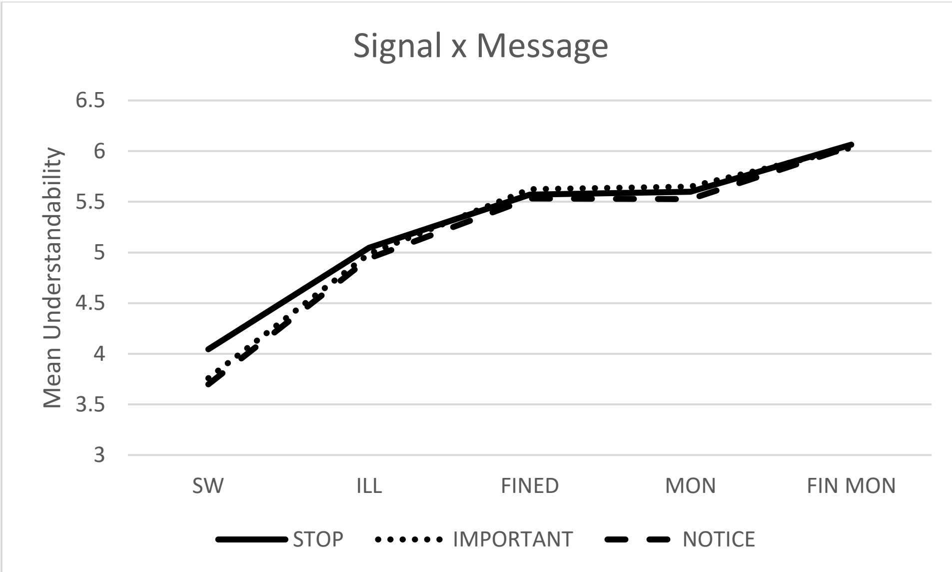



Figure 24. Mean understandability ratings as a function of signal word and message. SW (Signal Word), ILL (*This is illegal*.), FIN (*This is illegal. You may be fined.*), MON (*This is illegal. You may be monitored.*), FIN MON (*This is illegal. You may be monitored and fined.*)

## Discussion

The objective of this study was to uncover the most effective combination of icon and messages for alerting individuals about the danger in pirating music. Another goal was to determine the extent to which warning features, such as signal word and message formatting, would enhance understandability, attention-getting, compliance, carefulness, and representativeness, which contribute to warning quality. To achieve these goals, pictorials that were correctly interpreted by 67% of all study participants were carried over to the second study. Given that there were only four icons meeting the 67% criterion, there was no need to further pare down the number of icons by their ratings on the added dimension.

Icons containing the *slash* and *download*, symbols widely recognized and understood by respondents, consistently received high ratings in all measured variables. Further, respondents highly rated these icons in understandability, carefulness, compliance, and representativeness, regardless of the provision of a *computer* for context. This finding was consistent with previous studies indicating that symbols customarily used across various warning icons are the most effective, because they require minimal time for learning and mental processing (Lidwell et al., 2003). Together, these observations indicate that in the context of music piracy warning pictorials, the desired effects of compliance and carefulness results from understandability. This was especially true in Study 2 given that the correlations among the dependent variables were generally high ($r$ >. 5, Cohen, 1988).

Attention-getting qualities, however, appeared to improve by the addition of a computer for context (Garcia & Stakos, 1994). For instance, Icon 2 (*computer, slashed-download*) and Icon 1 (*computer slashed-upload*) received the greatest attention-getting scores. This indicates providing a computer for context aids in strengthening salience, because it increases complexity and thus decreases active visual search performance (McDougall, et al., 2000). In addition, if the symbols were relevant to task goals, then viewers will expend more time processing symbols, thus increasing perceptions of attention (Most, Scholl, Clifford, & Simons, 2005).

Participants clearly did not favor Icon 4 (*no computer, crossed-download*) as it was consistently among the lowest scored icons across all dependent variables. The addition of a *cross*, a less interpretable prohibition sign compared with the *slash* variation, may have caused decreased ratings in all measured variables, supporting recommendations that the slash should be applied to warnings due to familiarity effects (Murray et al., 1998). With no computer, the icon comprising of the highly rated *slash* and *download* symbols, was perceived by respondents to have a lower ability to attract attention relative to other icons. Therefore, the absence of a computer for *context* appeared to increase response ratings, further emphasizing its significant contributions. Together, these findings confirm the benefits of incorporating more traditionally used symbols as well as providing context in a warning design.

**Signal Words**

The signal words, STOP, IMPORTANT, and NOTICE, were found to influence warning effectiveness dimensions. Among the tested signal words, STOP and IMPORTANT, resulted in the greatest increase in carefulness, attention, and representativeness ratings. However, STOP was rated as more understandable than all three signal words tested. Signal words contributing to the warning’s explicitness in conveying the level of danger, and can be compared with one another according to attention-getting abilities. For example, DANGER received higher attention ratings than BEWARE and CAUTION (Adams, Bochner, & Bilk, 1998).

Based on the signal word dimension map, representing arousal strength (perceived hazard) and presence of risk, proposed by Hellier and colleagues (2007), the order of the current's tested signal words from highest to lowest arousal strength respectively was STOP, NOTICE, and IMPORTANT. With regard to explicitness in conveying the presence of risk, however, IMPORTANT, was uncovered as the strongest, followed by STOP and NOTICE, in respective descending order. However, when the intention is to arouse attention, STOP is recommended, followed by NOTICE, and IMPORTANT.

In agreement with Hellier et al.'s work (2007), one of the signal words that achieved the highest subjective ratings in almost all measured variables was STOP, which was the highest among the tested words in arousal strength. The other highly rated signal word in the current study, IMPORTANT, was among the strongest in risk explicitness under the dimensional map. Both of these words scored higher than NOTICE in attention, representativeness, and carefulness. Furthermore, high understandability ratings observed under STOP (i.e. strong hazard, low risk) are explained by the low perceptions of risk associated with this behavior due to the lack of past experience with these consequences.

Of note, none of the signal words seemed to be better than the other in terms of compliance ratings, implying their effectiveness in capturing attention, but not necessarily compliance. Yet, it is equivocal as to whether these results would transfer under the actual measurement of compliance with music piracy warnings. Furthermore, these results are in line with previous research showing that signal words with the highest perception of hazard will increase warning effectiveness, provided that the signal words accurately match the objectives or the risks of the referent (e.g., Edworthy & Adams, 1996; Hellier, et al., 2007; Wogalter & Silver, 1990; 1995).

The equivalence in compliance ratings among all three signal words tested, supports the notion that adherence to a warning is complicated by factors beyond the features of the warning icon itself. These findings notably disagreed with the dimension map developed by Hellier (2007). In addition to icon characteristics, such as color, signal word, and surround shape, risk perceptions can additionally be augmented by other methods, such as indicating that the message is from a credible and reliable source and tailoring the message to the intended target audience (Adams, Bochner, & Bilk, 1998; Williams & Noyes, 2007).

The target audience for this warning message is comprised of technologically savvy individuals with consequentially heightened familiarity with diverse computer mediated software. Level of experience may heighten familiarity with the software and associated devices to cause lowered perceptions of risk. In addition to the appeal for music, the ability to legally stream music may reinforce the pirating of music in a mutually benefiting manner, in part due to the familiarity with the procedures, devices, and software, necessary in executing these activities (Borja & Dieringer, 2016). The inverse relationship between familiarity and perception of risk were observed in research regarding tampon use (Godfrey & Laughery, 1984) and investigations examining perception of other potential threats. People felt less threatened by nuclear or chemical contamination if they resided close to nuclear or chemical plants, respectively, in part due to familiarity and perceived economic benefits (Grasa, Navarro, Rubio, Pena, & Santamaria, 2002). Similarly, along with optimism bias (Nandedkar, 2012), perceived benefits attached to illegal downloading or uploading behavior (Gayer & Shy, 2005; Chiang & Assane, 2008), are among the many individual attitudes and perceptions that can minimize risk perceptions. Likewise, having low experience with consequences, largely due to the inconsistencies in regulatory practices, can result in lowered compliance (Shanahan & Hyman, 2010). Thus, findings indicate that the use of signal words alone is not enough to increase compliance ratings.

As predicted, the addition of tested warning messages led to a corresponding increase in understandability, carefulness, attention-getting, compliance, and representativeness ratings. Contrary to expectations, however, the message addressing the possibility of being fined generally did not receive greater compliance ratings than the message regarding being monitored. The minimal experiences with these specific consequences (Shanahan & Hyman, 2010), may explain why respondents issued equal weights to these two separate messages.

**Icon x Message**

**Attention.** Results indicated that differences in attention ratings were affected by the interaction between icon and type of message. The signal word overall increased attention ratings for icons consisting of symbols that respondents found highly understandable. This occurred with and without the support of cues and saliency provided by the addition of a computer symbol. When the icon included only a signal word, Icon 2 (*computer, slashed-download*) and Icon 3 (*no computer, slashed-download*) were rated highest in attention relative to the other tested icons. As mentioned previously, both Icon 2 (*computer, slashed-download*) and Icon 1 (*computer, slashed-upload*) were the top two strongest performing icons in attention getting.

Including a message indicating illegality, led to slightly different effects. When pictorials were coupled with a message indicating illegality, respondents attended to Icon 1 (*computer slashed-upload*) more than Icon 3 (*no computer, slashed-download*), with Icon 2 (*computer, slashed-download*) still maintaining the most attention. In this case, notifying respondents that an action is illegal appears to compound the attention-getting qualities of icons with a computer symbol. Alternatively, it may be the case that respondents may not consider uploading for public use as severe as downloading for private use, perhaps because they viewed this as a means of sharing (d'Astous, et al., 2005). Text specifying that this otherwise innocuous activity is illegal appeared to provoke attention.

In sum, observed attention rating differences between the single addition of signal words and illegality statements merits further examination. The addition of a signal word to a less conspicuous pictorial (i.e., no computer) appears to elevate attention ratings to an extent equal to that of a given high performing icon (i.e., with computer), potentially due to the signal words' arousal producing or hazard conveying qualities (Hellier, 2007). Nonetheless, it is plausible that the increase in attention ratings resulted, because the pictorial initially began with such low ratings (i.e. floor effects). When more information regarding illegality is included into the message, however, only icons that were initially highest in salience due to perceived processing ease and/or past experience profits (Whittlesea, 1993), presumably because both signal words and illegality statements serve to promote the explicit qualities of effective pictorials.

Nevertheless, no differences in attention-getting were found among the top three icons (*computer slashed-upload, computer slashed-download, no computer slashed-download*) when referencing either or both consequences (i.e., *being fined* and/or *monitored*). Thus, the addition of consequences to Icon 4 (*no computer, crossed-download*) yielded the lowest ratings. The incorporation of crosses into the warning icon for prohibition may hamper attention either as a result of infrequency of use relative to the *slash* or due to decreased legibility (Freeman & Wogalter, 2001). Future studies may confirm the effects of the *cross* on attention through object measures, such as eye tracking or recall tasks.

**Compliance.** Interaction effects between message and icons impacted compliance ratings. Icon 2 (*computer-slashed-download*) exceeded compliance scores over all other icons, with the exception of Icon 3 (*no computer-slashed download*) when only a signal word was included. Nevertheless, Icons 3 (*no computer-slashed download*), 1 (*computer slashed-upload*), and 4 (*no computer, crossed-download*) were all equivalent with regards to compliance, providing further support of the effectiveness of Icon 2 (*computer-slashed-download*) compared with all other tested icons when only a signal word was used. This suggests the usefulness of signal words in inducing compliance for only the most understood and conspicuous pictorials. Recall that signal words had an opposite effect such that signal words alone appeared to enhance attention to pictorials that were considered less salient when presented alone. In agreement with

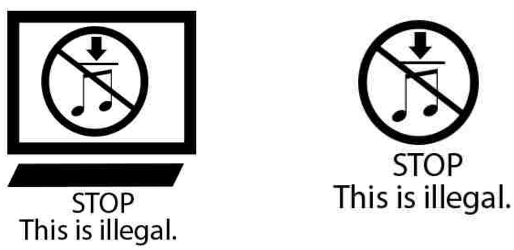



Figure 25. STOP and *This is illegal* message with and without context.

this reversed pattern, the order of icons under compliance shifted when the message, *This is illegal*, was added to the signal word, such that less conspicuous but more understood pictures (*no computer-slashed-download*) reached the level of compliance ratings comparable to its counterpart with the added computer symbol (*computer-slashed-download*). This finding is interpreted to reveal that the statement (*This is illegal)* is effective in raising compliance, because of not only the explicit nature of the message itself, but also its apparent sufficiency in creating a clearer relationship with illegal downloading behavior, in place of the computer symbols. Thus, in addition to increasing understandability (Vukelich & Whitaker, 1993; Wogalter et al., 2006), text appears to promote compliance through the provision of cues.

Furthermore, though previous studies have widely recognized the importance of warnings to achieve attention and compliance, these findings suggest that certain combinations may be more effective in achieving high ratings in one dimension more than another. Confirming these findings with future studies examining the influence of different combination of pictorial and message components on more objective measures of attention and compliance is suggested. Regardless, findings collectively suggest that Icon 2, consisting of context and understandable symbols, generates high attention-getting and compliance ratings when accompanied either by a signal word alone or when paired with a statement regarding illegality.

Icon 2 (*computer- slashed-download*) and Icon 3 (*no computer-slashed download*) were equivalent in compliance ratings under messages conveying *being fined*, *being monitored*, and *being monitored and fined*. However, Icon 2 (*computer- slashed-download*) exceeded ratings of Icon 1 (*computer-slashed-upload*) and Icon 4 (*no computer -crossed-download*). Differences in compliance scores between Icon 2 (*computer- slashed-download*) and Icon 4 (*no computer -crossed-download*) were not affected by the addition of consequences, as they continued to elicit the strongest and the weakest compliance ratings, respectively. When coupled with consequences, the *download* symbol and *slash* consistently emerged as the most effective means in communicating the hazards of music piracy. The addition of consequences revealed that an increase in explicitness may primarily function to increase effectiveness ratings only for icons that were judged by participants to be of higher quality.

Interestingly, in analyzing compliance ratings of messages within each icon, it was found that under Icon 4 (*no computer*, *crossed-download*), *you may be fined*, was not different from *you may be monitored*. However, the *you may be fined* message was greater in compliance scores than the *you may be monitored* message under Icon 1 (*computer slashed-upload*), Icon 2 (*computer, slashed-download*), and Icon 3 (*no computer, slashed-download*). Thus, within the higher rated icons, the hypothesized order of messages in terms of compliance ratings emerged: *you may be fined and monitored*, *you may be fined*, *you may be monitored*, *this is illegal*, and signal word only. High quality pictorials not only convey the referent message accurately on its own, but they also appear to guide viewers toward forming more accurate distinctions between these consequences when presented in textual form. This further supports the necessity of selecting warning pictorials using experimentally rigorous processes to ensure that the ultimate goal of compliance is achieved. Nevertheless, objective measures of compliance are needed to confirm this conclusion.

**Representativeness.** With regards to representativeness in the signal word condition only, Icon 2 (*computer, slashed-download*) was rated highest in representativeness over all other icons, with Icons 1 (*computer slashed-upload*) and 4 (*no computer, crossed-download*) receiving the lowest scores. This pattern was consistent with the remaining message condition conditions. These findings corroborated the effectiveness of Icon 2 (*computer, slashed-download*) in comparison with other tested icons.

The ratings of messages within each icon were observed in the expected order. The messages containing both types of consequences (*being fined* and *being monitored*) were highest in representativeness, followed by either consequence, a statement regarding illegality, and signal word alone. This finding confirms that both consequences are equally perceived by the respondents to be associated with music piracy.

## Signal Word x Message

**Understandability.** There were statistically significant differences in understandability across signal words when the pictorial only contained a signal word. STOP, was rated highest in understandability in comparison with NOTICE and IMPORTANT. When the message indicated *illegality* and being *fined*, there were no statistically significant differences among signal words. The importance of accurately matching the hazard level of the signal word, however, was strongly evident with the addition of the other tested consequence (Silver & Wogalter, 1989). When the message stated *being monitored*, respondents understood warnings with the signal word IMPORTANT better than NOTICE, and although it did not reach statistical significance, better than STOP. Considering that *being monitored* would not generally be regarded as a risky consequence, high ratings received when paired with IMPORTANT was not surprising given this signal word's relative position on the risk-explicitness map developed by Hellier (2007). The finding indicating no statistically significant differences between IMPORTANT and STOP, however, may demonstrate that being monitored may be a significant concern by the general population. Nonetheless, the lack of distinction displayed between signal words under *being fined* was unexpected, leading to the assumption that comprehension of this specific consequence may not benefit nor worsen from the addition of signal words.

## Limitations

Rating music piracy warnings may be limited by the hypothetical context of this study. Asking respondents to rate a potential warning label intended to instruct people to avoid violating a law that is not consistently enforced at the present time may affect perceptions, such as carefulness or compliance ratings. The present unlikelihood of music piracy risks may cause stated and actual ratings of presented warning stimuli to deviate in an unknown direction. These effects may be comparable to studies requesting respondents to assign ratings to a good not yet available in the market, referred to as hypothetical bias (Murphy, Allen, Stevens, & Weatherhead, 2005). However, the extent of hypothetical bias, or differences between stated and actual valuations, may vary depending on the design of the experiment (e.g., willingness to pay questions) or type of items (e.g., private goods) that are evaluated. In borrowing the concept from the marketing area, future studies may alternatively ask participants to indicate their willingness of risk for specific consequences. The use of rating scales to assess effectiveness, however, is appropriate given the exploratory nature of this study, with the understanding that findings must be later corroborated using more objective measures and/or naturalistic observations (Adams, Bochner, & Bilik, 1998).

In addition to the hypothetical nature of this study, awareness of the purpose of the experiment, through demand characteristics, may have confounded responses. For instance, a full version of tested workplace safety signs, consisting of hazard, consequences, and instructional statement received highest ratings in a similar approach used in the current study (Adams, Bochner, & Bilik, 1998). After comparing these ratings with those of another study in which groups were each assigned to rate message conditions across a variety of pictorials, no differences were found, leading to the conclusion that higher ratings given to the full version resulted from demand characteristics (Adams, Bochner, & Bilik, 1988). In Study 2, each of the following message conditions were sequentially added to the top performing warning symbols: signal word, *This is illegal*, *You may be fined*, *You may be monitored, you may be monitored and fined*. Additive effects of the different message conditions were subsequently assessed, which may have confounded results through demand characteristics. The number of statements as opposed to the message content may have influenced participant ratings (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Unlike the design applied to Study 1, the different tested message conditions were not factorially combined. With exception to the signal word condition, no other message conditions were tested against controls. Illegality statements and different levels under the consequence conditions, for instance, were neither tested singly nor without the presence of signal words

In summary, some caution must be taken in the interpretation of these results, because they may not replicate when collected under conditions wherein legal consequences are applied more regularly and frequently. In addition, demand characteristics may have an effect of rating results, because the combination of pictorials and text reveals to the participants the intent and motives leading to potentially inaccurate ratings. To minimize this confound, presenting different groups with one version of a sign was suggested (Adams, Bochner, & Bilik, 1998). For instance, a follow-up study consisting of an even more shortened list of pictorial and consequence combinations can be separated into a between groups design, so that each group would rate a variety of pictorials, while holding the message condition constant. Nonetheless, despite these potential limitations, the investigation highlighted ways in which pictorial elements can alter perceptions of understandability, attention, carefulness, compliance, and representativeness. Comparing these effects across conditions uncovered the relative strength of each component's contributions toward these desired dimensions.

## General Discussion

This study determined the best combination of symbols, selected and designed in accordance to literature guidelines, to communicate the illegality of music piracy. To investigate effects on attention, knowledge, and compliance (Laughery & Wogalter, 2011), participants rated test warning icons on various effectiveness dimensions (e.g., understandability, attention, compliance) and provided the meaning of each of those icons through an open-ended question.

Data revealed how different types of symbols and messages influenced various warning effectiveness dimensions. All symbol categories increased interpretability, as evidenced by the open-ended responses entered by the participants. Each symbol category, except action symbols, generated higher attention ratings. Though all contributed to higher carefulness ratings, none were singly effective in inducing high compliance ratings. Respondents gave higher ratings to icons with each addition of explicit and readable message conditions (e.g. signal word, illegality statement, consequences). The inclusion of all message conditions thus received the highest ratings in every warning effectiveness dimension. Significant interaction effects were also observed within the data.

The tendency of participants to consistently issue high ratings to the same symbols, accounts for the statistically significant correlations among the measured dimensions. The combination of understandability, attention, carefulness, compliance, and representativeness ratings may therefore reflect the general sense of perceived arousal by these stimuli. For instance, certain symbols, such as the *slash*, *badge*, *download*, appeared to repeatedly emerge as the highest rated scores across all dimensions.

## Pictorials

The study design was premised on warning literature recommendations to use visual stimuli (e.g., Kools, van de Wiel, Ruiter, & Kok, 2006; Young & Wogalter, 1990). The ability of pictures to transmit distinctive information was demonstrated using free recall tests (Paivio, Rogers & Smythe, 1968) and recognition tasks (Madigan 1983; Shepard, 1967). The benefits of visual representations in warnings may be established by our heightened memory for pictures relative to words, known as the picture superiority effect (e.g., Hamilton & Geraci, 2006; Wagner et al., 1997). In comparison to words, pictures require a more elaborative process for effective conceptual encoding which further induces implanting into memory (e.g., Hockley, 2008; Paivio, 1971). The findings reveal the pictorial as well as message characteristics that led to higher interpretability and warning effectiveness ratings.

## Picture Quality

**Concreteness.** Classifying symbols as either abstract or concrete is one approach in the investigation of visual images (e.g., McDougall, et al., 1999, Wang et al., 2007). Commonly understood pictorials are frequently concrete, as opposed to abstract, because viewers can easily match them with objects encountered in the real-world (Dewar, 1999; McDougall et al.,1999). During the design phase of this investigation, an expanded sample of symbols was considered, such as a picture of a jail cell, handcuffs, and police officer. Several icons did not adequately match the intended referent object, given the limited space allocated for this symbol category. Illegality symbols (i.e., *badge* and *bandit*) used in Study 1, however, were readily identifiable by participants, thus reinforcing literature recommendations to employ concrete symbols in instructional labels when possible.

Alternative measures of concreteness improve investigative objectivity by counting the number of the most basic pictorial components (e.g., lines, edges) (Garcia, 1996). Though noted to relate more to complexity (McDougall, et al., 2000), this measurement approach can explain the high understandability ratings of the down arrow and the up arrow compared with the combination down and up arrow symbol. Similarly, considering the number of edges, the ratings of the more complex cross symbol were observed to be lower than those of the slash symbol.

Despite its efficiency in transmitting a target message, concrete pictures are noted to still be inadequate if viewers can extract more than one meaning from them. The current findings revealed interpretation challenges even after applying the general recommended guidelines of clarity, legibility, and concreteness (Korpi & Ahonen-Rainio, 2015). Though both contributed to interpretability, the *bandit* appeared to outperform the *badge* due to its ability to communicate the key concept of illegality. For instance, several participants related icons with the *badge* with concepts such as safe and secure, particularly when prohibition symbols were not included. In contrast, several correctly associated the *bandit* with illegality and criminality, resulting in increased reports of carefulness. The misinterpretations of the badge are consistent with issues regarding users' perceptions of a privacy seal (Larose & Rifon, 2007). Users were less inclined to read privacy notices, because the seal prompted them to believe that their private information was protected.

**Familiarity.** Nonetheless, to minimize potential confusion, results strongly suggest that familiar symbols should be used whenever possible in music piracy warnings. The top four icons highest in interpretability ratings generally consisted of conventional symbols, such as the *slash*, *upload*, and *download* symbol. In contrast, a *cross*, a less frequently encountered prohibitive symbol (e.g., Murray et al., 1998), was contained within the consistently lowest rated icon in Study 2 in all measured dimensions. Of note, the combination of otherwise familiar symbols, were still found vulnerable to misinterpretation. For instance, the combination of arrows, signifying *upload* and *download*, showed improved interpretability rates when a *computer* was included in the symbol.

**Context.** The support of context in the warning research area (Cahill, 1975; Silver et al., 1995; Vukelich & Whitaker, 1993 Wolff & Wogalter, 1998) is corroborated by evidence from the cognitive psychology literature citing its effects on object categorization tasks (Joubert, Fize, Rousselet, Fabre-Thorpe, 2008). After observing that contextual information is processed quicker with broadly defined settings (e.g., mountain scene) as opposed to isolated components of that scene (mountains), researchers concluded that contextual processing occurs in parallel with object processing when comparing reaction times and categorization performance levels. In reference to the "coarse to fine" hypothesis, attention to information for quick categorization precedes the search for additional clues within the finer details of the visual object (e.g., Mace, Joubert & Fabre Thorpe, 2009; Schyns & Olivia, 1997). Though a variety of visual processing mechanism theories exist (e.g., Ullman, 2006), there is wide agreement that they likely occur in the early stages of visual processing for naturalistic stimuli (Torralba, Castelhano, Henderson, & Oliva, 2007).

In this study, the addition of a computer improved interpretability, and cued respondents to relate the warning pictorial within the intended context. For instance, several respondents conveyed that the arrow symbols denoted audio volume (e.g., "do not raise music volume up/down") in their meanings of warning pictorials without a computer. Thus, the provision of cues to provide context is recommended in the warning design, because of their capacity to enhance interpretability of potentially ambiguous symbols.

**Simplicity.** In addition to using familiar symbols and contextual cues, increased comprehension can occur by minimizing complexity in a music piracy warning pictorial. In the current investigation, the two icons with highest ratings in understandability, carefulness, and representativeness out of the four most interpretable icons consisted of a *slash* and a *download* symbol. However, when accompanied by illegality symbols, icon complexity increased and confused the intended message. Past research showed that managing symbol complexity (e.g., Forsythe, Mulhern, & Sawey, 2008; Hoeger, 1997) and familiarity (e.g., Forsythe, et al., 2008; McDougall et al., 1999) enhances overall comprehension by minimizing cognitive processing. Comprehension is therefore best achieved through the acceleration of processing speed, by using few, but familiar symbols as possible in warning icons for music piracy.

**Distinctiveness.** Cognitive processes that contribute to comprehension, however, are separable from those that relate to attention (Posner, 1990). Pattern recognition, target detection, and heightened alertness are three processes associated with attention (Posner, 1990). Pattern recognition is facilitated by symbols that mentally organize visual stimuli in preparation for comprehension. In this study, categorization cues offered by the *computer* symbol is asserted to fulfill this process. Secondly, target detection is increased by symbols with visually distinctive qualities. Thus, the high attention ratings observed under the *badge* and *bandit* may exhibit their capacity to increase target detection. It can also be reasoned that distinctiveness can be strengthened with the added complexity from a salient symbol, such as the enlarged computer image, used in this study. The third attentional process involving a heightened state of vigilance is difficult to assess, however, without the use of more physiological measures such as eye tracking and heart rate. Yet, it should be noted that higher carefulness ratings assigned to illegality symbols (e.g., *bandit* or *badge*) may imply these symbols' potential in achieving a heightened sense of attention, but not to a sufficient extent to increase compliance ratings. These interpretations must be validated by investigations that incorporate experimental tasks, such as recognition and recall.

The demands of a computer mediated environment can compromise attention to warnings when music piracy is at most risk, due to inattentional blindness (Lavie, 2007). The greater the cognitive resources allocated to a given task, the less likely that a presented stimulus, particularly if perceived irrelevant to the task, will be noticed. In addition to the intense focus placed on the engaged task, the warning may be ignored, because of the presence of competing visual stimuli. Placing the warning within a blank background, adding color, or incorporating movement to static displays (blink, hop) are some techniques to overcome inattention (Jefferson, 2013). Furthermore, evidence from past studies suggest that audio or touch (i.e., vibration) may not only enhance noticeability, but also potentially increase the amount of information conveyed in certain warning devices (Haas & van Erp, 2014). A study by Wogalter and colleagues (2014) found that using audio and visual systems to concurrently transmit redundant information for prescription drug risk disclosures led to better recall and recognition than when each of the modes were used alone (Wogalter, Shaver, & Kalsher, 2014). Website owners, however, may argue that these implementations may prove impractical or unnecessarily disruptive for their valued users.

On the other hand, there is evidence that extreme strategies may not be necessary to enhance attention-getting capabilities if the warning icon is placed on a website. One may notice a stimulus enough to be recognizable in later presentation due to perceptual load. Referred to as the “spill over” effect, individuals have the capacity to attend to a task with a minimal degree of perceptual resources left over to notice, but not necessarily understand what peripherally located stimuli mean (Lavie, 2007). A comparison between web ads, for instance, found that memory was not strictly contingent on active involvement with them (i.e., clicking on the ad), and if sizable enough, their mere presence can influence subsequent product attitudes (Chatterjee, 2008). Although viewers may ignore banner ads, the processing of ads can be better measured through recall and recognition, which can only be strengthened by repeated exposure (Dreze & Hussher, 2003).

**Text**

The advantages of including both picture and text are widely established across the warning literature and supported by Study 2 findings. The presentation of both types of stimuli stimulates dual mechanisms for swifter processing (Paivio, 1990). Text adds clarity to ambiguous abstract objects and to unfamiliar concrete objects by transmitting the intended meaning via a simple and easy to read format (Isherwood et al., 2007; Ng & Chan, 2009; Wogalter, Sojourner, & Brelsford, 2010). In addition, text supplements the pictorial by accurately conveying its associated risks along with their severity and probability (Laughery et al., 1993). Study 2 results not only substantiated the advantages of text, but also added to past evidence revealing the need for an appropriate match between signal word and message (e.g. Amer & Maris, 2007).

**Readability.** Message comprehension is heavily influenced by text complexity. The different message conditions of this study were designed to account for readability. In averaging the grade levels of a variety of reading tests (Flesch-Kincaid, Gunning-Fog Score, Coleman-Liau Index, and SMOG Index), the minimum required number of years in education to understand the presented messages was approximately 5 years. Presenting text that is accessible by a wide audience, offers the obvious advantage of adequately informing the target audience (Rogers et al., 2002). Reading ease is imperative when constructing a warning designed to inform users of potential consequences, because it particularly allows users to reserve the cognitive resources needed to reach informed decisions (Hancock, Fisk, & Rogers, 2015; Wogalter, Soujourner, & Brelsford, 2010). Disregard for the presented warning information may arise from the burden of engaging in high memory or cognitively loaded tasks (e.g., Hancock, Fisk, & Rogers, 2015). The tested message conditions in this study adhered to Laughery and Brelsford's (1991) suggestions that the target reading level be between fourth and sixth grades.

**Explicitness.** In efforts to encourage compliance, explicit warnings overtly define restricted behaviors and associated risks for viewers (Laughery et al, 1993; Rogers, 2000). Past research additionally revealed that participants complied with warnings expressing high injury severity than low injury severity (e.g., Wogalter & Barlow, 1990). Explicitness is commonly achieved in textual information with signal words (Silver & Wogalter, 1989) and messages (e.g., Frantz, 1994; Laughery et al., 1993). Higher ratings were given to music piracy warnings that contained the signal words, STOP and IMPORTANT. Past studies linked IMPORTANT and STOP to greater arousal strength and risk potential than the alternate signal word condition, NOTICE (Hellier, et al., 2007). Highest ratings given to warning icons conveying both consequences (i.e., *being fined and monitored*) affirmed the positive influence of explicitness on warning effectiveness as compared to including one consequence. In other words, when the severity of the hazard and its related consequences are clearly understood by viewers, compliance is likely to follow.

**Matching.** Warning literature recommends creating an appropriate match between signal words and consequences, based on arousal strength and probability of risk (e.g., Hellier et al., 2007; Young, 1998). Across all icons, STOP received the highest understandability scores compared with both IMPORTANT and NOTICE. According to Hellier's dimensional map (2007), STOP is associated with the highest arousal strength compared with both IMPORTANT and NOTICE. Conversely, IMPORTANT is associated with greatest risk perceptions among the selected signal word conditions. Participants generally gave the highest ratings in the study overall to warning icons with IMPORTANT and STOP. However, STOP had higher understandability ratings than both IMPORTANT and NOTICE. This showed that participants associated the music piracy warning with great hazard, but with lower probability of risk. When the signal word and message pairs aligned with upheld beliefs, understandability ratings increased.

The practice of matching messages with the appropriate signal word can be extended to include pictorials in music piracy icons. Two of the top performing warning icons (*computer slashed-download* and *no computer slashed-download*) received higher perceived compliance ratings when paired with being fined than when being monitored. This outcome aligned with the predicted pattern. In contrast, participants did not indicate differences between these consequences under the lowest performing icons (*computer slashed-upload* and *no computer slashed-download*). An appropriate match of all three elements appears to be instrumental in minimizing ambiguous instructions. In support of previous investigations (e.g., Amer & Maris, 2007; Hellier et al., 2000; Wogalter et al., 1998; Wogalter & Laughery, 1996; Wogalter & Silver, 1990), the current study provides further evidence that assuring a harmonious combination among the different components of a warning icon may enhance communication.

**Implications**

Overall, the interpretation accuracy rates of the tested music piracy warnings were generally low, with only four out of seventy-two meeting ISO comprehensions standards. Considering that interpretation accuracy only, but slightly, related with self-reports of understandability, the ability of participants to extract accurate meanings may be fundamentally distinct from judgments regarding carefulness, attention, compliance, and representativeness.

There are several plausible explanations for the consistency of rating levels observed across the perceived warning effectiveness dimensions. The moderate to high correlation coefficients (Cohen, 1988), for instance, indicates that collapsing the rated dimensions can conceivably represent a more general perception of warning effectiveness or appeal for the displayed warnings. Alternatively, the pattern of current results perhaps suggest that music piracy warnings may achieve high subjective ratings to the extent that they are perceptually coherent to the viewer. In accordance to a cognitive psychology framework, perceptual fluency is related to familiarity (Westerman, 2008), perceived pleasure (Reber, Winkielman, & Schwarz, 1998) and validity (Reber & Schwartz, 1999). Stimuli that are perceptually fluent tend to be automatically retrieved from memory with ease (Yonelinas, 2002). The repeatedly high ratings that emerged from conventional or familiar symbols across multiple dimensions are viewed to support this claim. Less common symbol combinations led to corresponding decreases in ratings.

In addition to past exposure to symbols, agreement between connoted message and upheld attitudes or beliefs can be inferred to increase music piracy warning ratings. Past studies concur that a majority of individuals do not associate music piracy with the concept of stealing

(Selwyn, 2008), which is likely more directly conveyed by the *bandit*. Although respondents tended to interpret pictorials with the *bandit* with greater accuracy than with the *badge*, they viewed the *badge* as more effective than the *bandit* potentially due to perceptual coherence. Under the premise that the resulting high ratings correspond with established attitudes or beliefs (e.g., Allen, Shepherd, Roberts, 2010; Chiou & Hang, 2005; Ingram & Hinduja, 2008), the ratings for warning effectiveness perceptions, as it relates to music piracy warnings, may conceivably reflect perceptual coherence.

Increasing comprehension through perceptual fluency is vital when viewers place more focus on a prevailing task than on irrelevant visual displays in a computer mediated situation (Koivisto & Revonsuo, 2007). To overcome these challenges, viewers must theoretically be able to comprehend carefully designed music piracy warning icons with as little effort as possible. Achieving this objective ideally entails incorporating symbols that are familiar, least complex, and conceptually fluent. Because compliance to warnings may be complicated by external factors, such as cost in complying (Wingrove, et al., 2011), perceived risks (e.g., Chiang & Assane, 2008), and social influence (Wogalter, Allison, & McKenna, 1989), it may prove worthwhile to consider the viewer perceived cost in comprehending the displayed warning icon. The ability to process the music piracy warning within the shortest span of time and with the greatest ease would minimize these costs.

Controlling the perceived costs for comprehension can also be achieve by including warning text at the easiest reading level. Reading ease is imperative when constructing a warning designed to inform users of potential consequences, because it can allow users to reserve the cognitive resources needed to reach informed decisions (Hancock, Fisk, & Rogers, 2015; Wogalter, Soujourner, & Brelsford, 2010).

The current FBI seal used for piracy is accompanied by the following text (FBI.gov, 2016 12/27/2016): www. Fibi.ogr/investigate/whit-collar-crime/piraicyiptheft/fbie-anti-piracy-warning-seal

*"The unauthorized reproduction or distribution of a copyrighted work is illegal. Criminal copyright, including infringement without monetary gain, is investigated by the FBI and is punishable by fines and federal imprisonment."*

A Flesch-Kincaid Reading Analysis concluded that the FBI warning requires 16.7 years of schooling to understand the text. An average grade level of 19.0 years was calculated based on analyses using the Flesch-Kincaid, the Gunning-Fog Score, Coleman-Liau Index, SMOG Index, and the Automated Readability Index (Online-Utility, n.d.).

Aside from cognition demands, other proposed implications concern the potential effects of motivation and/or intellect. Out of the seventy-two total tested icons, only four icons emerged as meeting industry standards for comprehension when examining data from all participants who initiated the study. However, the analysis of ratings from participants who fully completed the survey indicated that more icons met the minimal interpretation accuracy rate. The level of commitment and interest may plausibly differentiate between participants who did and did not complete the on-line survey. Alternatively, the higher accuracy rates may be attributed to cognitive ability or intellect. Thus, the inclusion of ratings from both sets of participants provides assurance that the top four identified icons were indeed interpreted with the greatest ease, irrespective of motivation, among the seventy-two tested.

## Recommendations

Symbols including the *slash*, *cross*, *download*, *upload*, *badge*, and *bandit* are proposed to increase interpretation of music piracy warnings. Without any symbols to communicate the restriction of the denoted action, the data revealed that the *bandit* would significantly improve interpretability as compared to the *badge*. The addition of a *slash* or *cross* did not benefit from the addition of a symbol connoting illegality. Therefore, using a prohibitive or illegality symbol, but not both, is sufficient to deliver the intended message.

Based on Study 2 data, the highest performing music piracy warning pictorials were the *computer, slashed-download* and the *no computer, slashed-download* symbol combinations. Including signal words such as STOP and IMPORTANT paired with text that communicates illegality and all potential consequences is proposed. The addition of statements referring to illegality, being fined, and being monitored, is recommended due to their additive effects on warning effectiveness dimensions. Nevertheless, follow up investigations are necessary to verify these preliminary recommendations.

## Strengths

This investigation contributes to the body of knowledge in warning literature, because no previous studies examined the effectiveness of symbols or warning messages for music piracy. Though music piracy is a computer-mediated behavior, research pertaining to static labels and signs, such as those associated with pharmaceutical products (e.g., Chan & Chan, 2013; Wogalter et al., 2010), traffic signs (Ng & Chan, 2009), and other areas where health and safety (Spink, Singh, & Singh, 2011) are of primary importance were considered. Across these studies, features such as familiarity, explicitness, and legibility, positively impacted warning effectiveness primarily by enhancing comprehension and/ or attention (Rogers et al., 2002).

Huang and colleagues (2002) determined that relative to styling quality, message quality, and metaphor, comprehensibility and identifiability (locatability) are critical features to implement in the design of computer icons (e.g., Huang, Shieh, & Chi, 2002). The present study applied both objective and subjective measures for comprehensibility, through the analysis of open-ended answers (i.e. interpretability) and self-rating scales (i.e., understandability), respectively, in the first study. The same issues faced by website privacy notices detailing the handling of digital information, such as readability and length, in addition to various attitudes inherent in web-mediated activities (Milne, Culnan, & Greene, 2006) may potentially complicate music piracy warnings. In adherence to Milne et al.'s (2005) suggestions, textual readability and length were adjusted to promote comprehension when paired with the highest interpretable warning symbols in Study 2.

Another major contribution of this investigation was the use of a systematic procedure in the design of test warning icons. This was performed by assuring that each conceptual element of the target message (Nakamura et al., 2012) was represented by a corresponding image that was simple in design or familiar to a general audience (Korpi & Ahonen-Rainioi, 2015). The target message for this study was: "Do not illegally download/upload music." For instance, *do not* was represented by two common pictorials used to denote prohibition: the *slash* and the *cross* (Freeman & Wogalter, 2001). Similarly, the actions of download and upload were specified within the visual image using a *down* arrow, an *up* arrow, and the combination thereof, into one symbol (i.e., *download/upload*). Furthermore, this study aimed in testing the effectiveness of a *bandit* and the *badge* to denote illegality, which has not been investigated in research studies thus far. These efforts led to the designation of functional categories for each target concept (i.e., prohibition, action, context, illegality) and its underlying experimental conditions (e.g., *slash*, *down arrow*). Pilot symbols were assessed at both a categorical and individual level for not only their capacity to generate accurate responses (i.e., interpretability), but also their perceived effectiveness across a variety of warning dimensions.

**Limitations**

During the analysis phase of this investigation, it was later discovered that the results may have been confounded by history effects. The ability of participants to exit and re-enter the survey allowed the survey to be completed over a span of several days. Participant experiences may have potentially impacted responses between data collection. To confirm the current results, follow-up studies should assure that the online survey is completed within one period. Though representativeness ratings were collected last across all participants, the randomized presentation of rating scales may arguably alleviate any inaccuracies in responses.

In addition to history effects, this study was susceptible to other limitations common to warning research. Interpretations, for instance, may be limited by the convenience sample of university students, potentially restricting generalizability. It can also be argued that the obtained sample is appropriate, because music piracy is usually executed by a younger population (Malin & Fowers, 2009). Nevertheless, examining warning effectiveness on other populations, consisting of a wider age range or of diverse educational backgrounds would conform to current research standards. Another limitation is the single presentation of graphic warnings through a computer screen, which may cause participants to attend to them differently than if they were encountered under more naturalistic conditions; thus, limiting external validity. Because attrition rate may have compromised data accuracy, future surveys must be brief as possible. Applying the results from the current investigation can help devise future studies with much less stimuli and fewer questions. Furthermore, the tendency for respondents to issue consistent responses, particularly if the questions are similar with one another, may have potentially aggravated inaccurate results (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Separating the dependent variables so that the measures are obtained from different groups or sources may address this issue, if it is more practical in terms of time and effort involved.

**Future Studies**

Due to the exploratory nature of this investigation, future studies can study warnings effectiveness through more objective procedures that capture other forms of data, such as response time, recall rate, or actual compliance. Furthermore, deeper investigations can focus on identifying how a variety of issues can affect music piracy warning comprehension, attention, or compliance. For instance, future studies can test other potential warning designs, manipulate location, uncover connections with individual differences, and demonstrate connections with cognitive demands.

**Warning design.** Testing the effect of color and border, may be conducted in conjunction with dynamic mechanisms to increase salience, such as temporary color changes and movement. Although the development of synchronized system to regulate piracy is still pending, it may prove practical to expand the current list of signal words with increased arousal strength, yet decreased perceptions of risk. For instance, to preserve understandability and perceived hazard, signal words such as NOTE, CAREFUL, or BEWARE, can be tested. The need for the expansion of signal words is indicated by current result findings showing no differences among the tested signal words within the different message conditions. In addition to signal words, testing a wider variety of symbols that may be relevant to music piracy warnings should be pursued by future investigations, including different versions of a badge and a picture of a pirate.

**Location.** Future studies can compare the effectiveness of various forms of visual or textual components based on location or format. Music piracy warnings may require different designs depending on format (e.g., pamphlet, poster) and location. Because context had a strong positive influence on attention, future studies could also investigate if placing warnings in certain locations, such as a computer lab, will be as effective as including a computer for context on highly rated icons. This may address space limitations in warning designs, yet reduce cognitive load so that the message conveyed by the icon can be processed with greater efficiency.

***Individual Differences.*** Music piracy warnings should be tested to gain a better understanding of how individual factors, such as beliefs, attitudes, and cognitive ability, may affect attention, comprehension, or compliance (Laughery & Wogalter, 2006; McLaughlin & Mayhorn, 2014). Investigations into salience, for instance, found that compliance attitudes toward cigarette warning labels that were placed in plain packaging only increased among those who were infrequent or did not smoke (Munafo, Roberts, Bauld, & Leonards, 2011).

Examining the success of highly rated icons on certain subgroups of a target population, based on age, music piracy attitudes, education level, or pirating behavior, may also be beneficial. The combination of pictorials and text may differ as a function of country, such as in France, where piracy is more consistently regulated (Danaher, Smith, Telangh, & Chen, 2014). Thus, the current study findings can be complemented by comparing the efficacy on test pictorials within different regulatory environments.

Likewise, examining how various antecedents found in literature, such as technological ability (Borja & Dieringer, 2016) or self-control (Malin & Fowers, 2009), can affect interpretability or perceptions of warning effectiveness can enlighten results. Current findings call for additional empirical assessments to confirm that interpretation success is contingent on motivation and cognitive ability in music piracy warnings.

***Other potential challenges.*** Beyond testing the qualities of the warning, it is important to consider the surroundings of the icon when selecting the most appropriate symbol. For instance, distinctiveness may be a priority when other similar looking symbols will be adjacent. When the target audience is engaged in other tasks, however, developing an icon that will transmit clear instructions swiftly may be necessary. Current findings suggest that music piracy warnings need to be comprehended swiftly for optimal importance. Hence, gaining an understanding of how various potential warning icons perform under differing cognitive attention conditions, can assist in identifying a variety of viable music piracy icons.

Relatedly, determining how other potential symbols or textual elements may facilitate or disrupt comprehension or perceptual fluency is proposed. Given that a symbol of a badge is customarily used in FBI anti-piracy warnings, testing its effects against other types of symbols or measures to represent the concept of illegality should be explored. It is recommended that future studies place greater focus on understanding the influence of perceptual fluency on music piracy warning design. Gaining clarity on its effects require the use of more objective measures of measuring effectiveness, such as attention and compliance, as opposed to the perception ratings used in this study.

**Closing Remarks**

Several reports indicate that piracy behavior is decreasing, largely as a result of the swift response by music business to change services to provide the qualities and convenience that were coveted by P2P users. For instance, instead of albums, people may now download individual songs to incur less expense or to sample the work. Furthermore, commercial music websites now offer a social component, by allowing users to update others regarding their purchase or to view their playlists. In addition, streaming services which reduce costs and offers access to a wide variety of songs are increasingly prevalent. In short, current business models allow music to be affordable, social, and portable.

Nevertheless, the rapid emergence of advanced technologies and software unleashes new ways for technological savvy users to obtain media content for free. The latest threats to protected music predominantly involve the illegal copying of streamed music and the storage of music using cyber-lockers. During Fall 2016, legal action was taken against a site, which assists infringers in securing an audio copy of music videos posted on Youtube, without the necessary permissions (IFPI World's Largest Music Streaming Site Faces International Legal Actions, 2016). As much as 49% of all 16 to 24 year-olds are reported to use this illegal service with an estimated 60 million new users per month. Considered among the most popular means in pirating music, the YouTubeMP3.com website is estimated to generate hundreds of thousands of dollars per month from advertising, without offering compensations to artists. Another emerging source of media infringement involves the use of online digital storage lockers, such as Megaupload, which facilitates pirating by issuing monetary rewards to users who upload popular material. The service is structured so that fees are issued to users for the ability to download the content quicker.

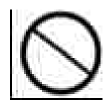
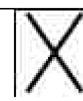
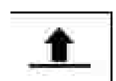
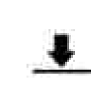
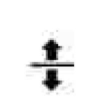
Socio-behavioral literature provides evidence that music piracy can be deterred by strategies that address perceptions of risk and/or consequences. Concerns regarding punishment and the generalized obligation to obey the rule of law, for instance, were among the factors that had the strongest relationship to self-reported downloading behavior (Wingrove, Korpoas, & Weisz, 2011). Furthermore, past studies revealed that engagers tend to lack self-control (Shanahan & Hyamm, 2010) and view digital piracy differently than other physical forms of theft (Bowie, 2005).

In concordance with these findings, the FBI instructs merchants to display a standardized anti-piracy graphic, consisting of vividly colored symbols (seal and stars), accompanied by a branded FBI mark (FBI Internet Piracy, n.d.). This warning pictorial is available for public use under the condition that they are used solely to inform consumers to comply to copyright laws as they use a product. Unlike the FBI warning seals, however, current findings suggest that providing a visual reminder designed to precisely convey the restricted action and its associated consequence may prove more effective. This approach can help ensure that viewers will unmistakenly and immediately recognize the behaviors that should be avoided. Clarity in communication may prove to offset any habituation effects, or unawareness of the symbol after multiple presentations, which often occurs when consequences are not immediately experienced.

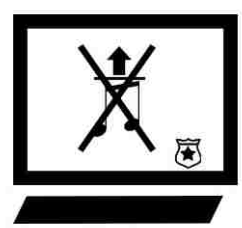
In conclusion, in an increasingly fast-paced and information dense world, people have a more pronounced need for mechanisms to filter and condense information most relevant to them in a given time and place. The growing use of shortened text and emojis, for instance, as a means of communication, lends credence to this need. Music is a central component of culture by providing an outlet for expressing moods and emotions. This strong affinity for music (Moe & Fader, 2001) can theoretically cause one to forget the potential penalties for laws, particularly within a digital space. To assist in overcoming these emotionally driven attitudes and behaviors, findings from the study suggest using plain language and unambiguous pictorials to define complicated laws amidst an informationally cluttered environment.

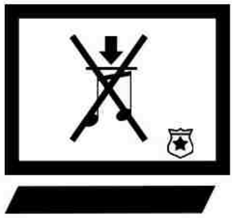
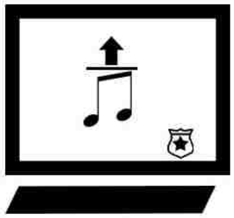
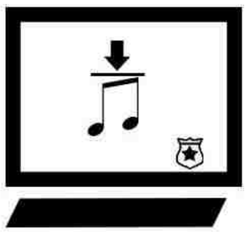
## Appendix A: Message Icons

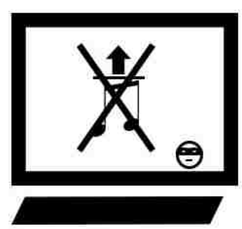
*Concepts in target message as a function of the experimental design of icons.*

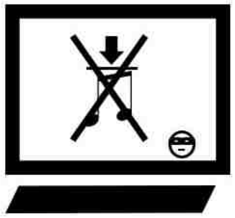
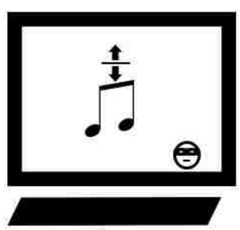
| **Target Concept:** | **Graphic Image** | |
|---|---|---|
| Computer | Computer | [redacted] |
| Control | No Computer | |
| Illegality | Badge |  |
| | Bandit |  |
| | Control | |
| Prohibition | Prohibitive sign |  |
| | Two crossed slashes |  |
| | Control | |
| Actions | Uploading |  |
| | Downloading |  |
| | Uploading/ Downloading |  |
| | Control | |

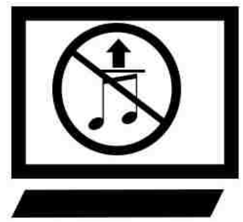
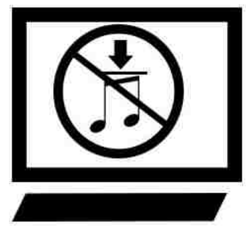
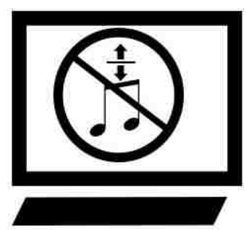
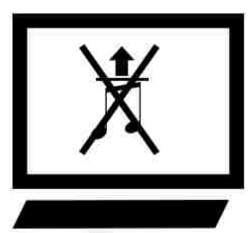
## Appendix B: Test Icons

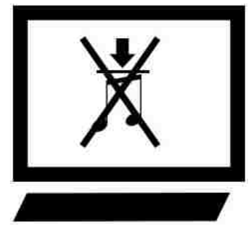
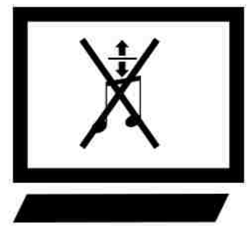
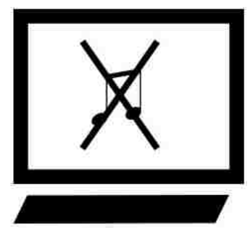
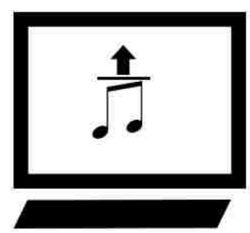
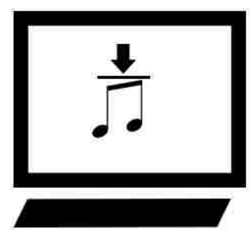
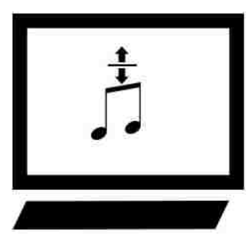
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | badge | prohibition sign | upload | 1 |  |
| Computer | badge | prohibition sign | download | 2 |  |
| Computer | badge | prohibition sign | upload/download | 3 |  |
| Computer | badge | prohibition sign | control | 4 |  |
| Computer | badge | crossed slashes | upload | 5 |  |

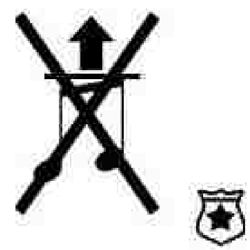
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | badge | crossed slashes | download | 6 |  |
| Computer | badge | crossed slashes | upload/download | 7 |  |
| Computer | badge | crossed slashes | control | 8 |  |
| Computer | badge | control | upload | 9 |  |
| Computer | badge | control | download | 10 |  |
| Computer | badge | control | upload/download | 11 |  |

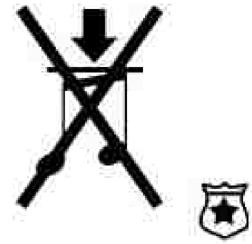
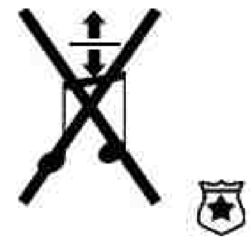
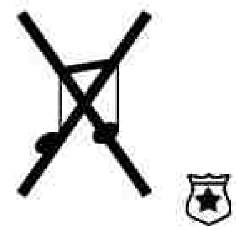
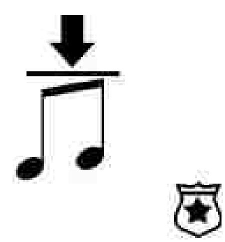
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | badge | control | control | 12 |  |
| Computer | bandit | prohibition sign | upload | 13 |  |
| Computer | bandit | prohibition sign | download | 14 |  |
| Computer | bandit | prohibition sign | upload/download | 15 |  |
| Computer | bandit | prohibition sign | control | 16 |  |
| Computer | bandit | crossed slashes | upload | 17 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | bandit | crossed slashes | download | 18 |  |
| Computer | bandit | crossed slashes | upload/download | 19 |  |
| Computer | bandit | crossed slashes | control | 20 |  |
| Computer | bandit | control | upload | 21 |  |
| Computer | bandit | control | download | 22 |  |
| Computer | bandit | control | upload/download | 23 |  |

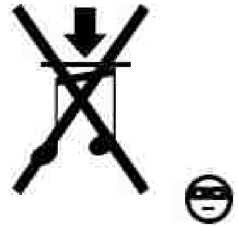
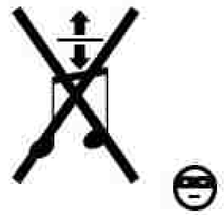
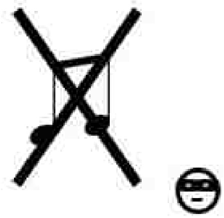
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | bandit | control | control | 24 |  |
| Computer | control | prohibition sign | upload | 25 |  |
| Computer | control | prohibition sign | download | 26 |  |
| Computer | control | prohibition sign | upload/download | 27 |  |
| Computer | control | prohibition sign | control | 28 |  |
| Computer | control | crossed slashes | upload | 29 |  |

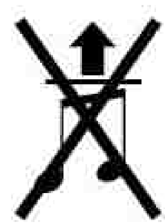
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | control | crossed slashes | download | 30 |  |
| Computer | control | crossed slashes | upload/download | 31 |  |
| Computer | control | crossed slashes | control | 32 |  |
| Computer | control | control | upload | 33 |  |
| Computer | control | control | download | 34 |  |
| Computer | control | control | upload/download | 35 |  |

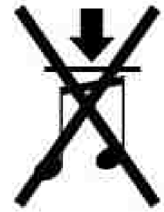
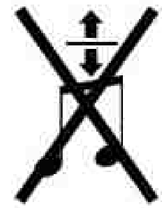
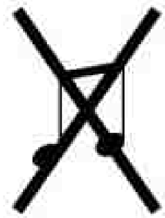
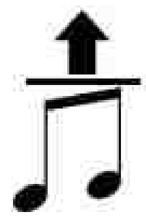
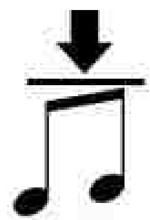
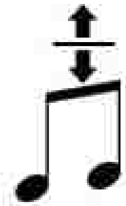
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| Computer | control | control | control | 36 |  |
| No Computer | badge | prohibition sign | upload | 37 |  |
| No Computer | badge | prohibition sign | download | 38 |  |
| No Computer | badge | prohibition sign | upload/download | 39 |  |
| No Computer | badge | prohibition sign | control | 40 |  |
| No Computer | badge | crossed slashes | upload | 41 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | badge | crossed slashes | download | 42 |  |
| No Computer | badge | crossed slashes | upload/download | 43 |  |
| No Computer | badge | crossed slashes | control | 44 |  |
| No Computer | badge | control | upload | 45 |  |
| No Computer | badge | control | download | 46 |  |
| No Computer | badge | control | upload/download | 47 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | badge | control | control | 48 |  |
| No Computer | bandit | prohibition sign | upload | 49 |  |
| No Computer | bandit | prohibition sign | download | 50 |  |
| No Computer | bandit | prohibition sign | upload/download | 51 |  |
| No Computer | bandit | prohibition sign | control | 52 |  |
| No Computer | bandit | crossed slashes | upload | 53 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | bandit | crossed slashes | download | 54 |  |
| No Computer | bandit | crossed slashes | upload/download | 55 |  |
| No Computer | bandit | crossed slashes | control | 56 |  |
| No Computer | bandit | control | upload | 57 |  |
| No Computer | bandit | control | download | 58 |  |
| No Computer | bandit | control | upload/download | 59 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | bandit | control | control | 60 |  |
| No Computer | control | prohibition sign | upload | 61 |  |
| No Computer | control | prohibition sign | download | 62 |  |
| No Computer | control | prohibition sign | upload/download | 63 |  |
| No Computer | control | prohibition sign | control | 64 |  |
| No Computer | control | crossed slashes | upload | 65 |  |

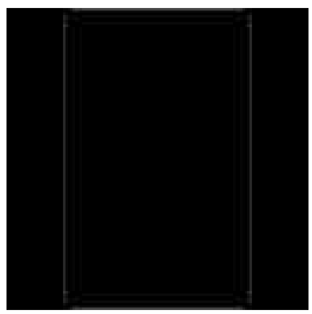
| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | control | crossed slashes | download | 66 |  |
| No Computer | control | crossed slashes | upload/download | 67 |  |
| No Computer | control | crossed slashes | control | 68 |  |
| No Computer | control | control | upload | 69 |  |
| No Computer | control | control | download | 70 |  |
| No Computer | control | control | upload/download | 71 |  |

| Context | Illegality | Prohibition | Action | Icon # | |
|---|---|---|---|---|---|
| No Computer | control | control | control | 72 |  |

Other test pictorials:

Icon #73

Icon #74



## Appendix C: Survey Questions

Participants will answer the following questions for each icon:

1. What does this icon mean? (A space will be provided for subjects to write in their interpretations of the meaning of the icon.)

2. How <u>understandable</u> is this icon to you?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not at all understandable | | Somewhat understandable | | Under-standable | | Very Understandable | | Extremely understandable |

3. How <u>careful</u> would you be after seeing this icon?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not at all careful | | Somewhat careful | | Careful | | Very careful | | Extremely careful |

4. How <u>attention-getting</u> is this icon?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not at all attention-getting | | Somewhat attention-getting | | Attention-getting | | Very attention-getting | | Extremely attention-getting |

5. What is the <u>likelihood of compliance</u> to this icon?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not at all likely | | Somewhat likely | | Likely | | Very likely | | Extremely likely |

6. How <u>representative</u> is this icon of the following definition: “Do not pirate music”?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|
| Not at all representative | | Somewhat representative | | Representative | | Very representative | | Extremely representative |

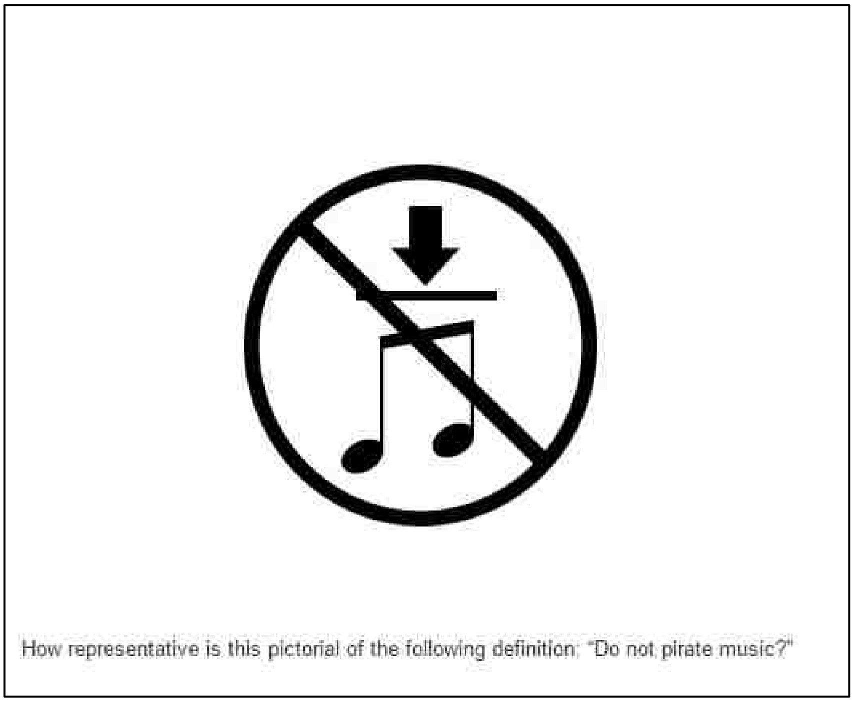
Demographic Questionnaire

1. What is your age? ______
2. What is your sex? (Male, Female)
3. What is your ethnicity? (Caucasian, African American, Hispanic, Asian, Pacific Islander, Other)
4. What is your class (Freshman, Sophomore, Junior, Senior)
5. Is your primary family language English? (Yes, No)
6. Have you ever used peer-to-peer networks (e.g. bit torrent, pirate bay, napster)?
7. Have you ever uploaded music on the Internet? (Yes, No)
    a. If so, which sites have you uploaded it for?
8. Have you ever download music on the Internet? (Yes, No)
    a. If so, which sites have you downloaded it for?
9. How many hours do you used the Internet per week to listen to music?
10. I believe that uploading copyrighted music is illegal. (True, False)
11. I believe that downloading copyrighted music is illegal. (True, False)

Please rate the degree to which you agree with the following statements.

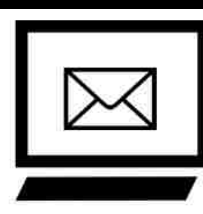
12. I believe that uploading music is morally acceptable. (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree).
13. I believe that downloading music is morally acceptable. (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree).

## Appendix D: Sample Test Question




*Sample screen shot of question and test icon presented through Qualtrix.*

## Appendix E: Distractors

| | | |
|---|---|---|
| [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] |
| [redacted] | [redacted] | [redacted] |
|  | [redacted] |  |

| | | |
|---|---|---|
|  | | |

## Appendix F: Example Study 2 Stimuli

*Example stimuli for Study 2 for signal word STOP*

| | |
|---|---|
| [redacted] monitored | [redacted] monitored and fined. |

Table 1.Study 1 Correlations Of Dependent Variables.

| Dependent Variables | M | SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| Interpretability | .37 | .25 | 1 | .257** | -.011 | .050 | .036 | .088 |
| Understandability | 4.56 | 1.56 | .257** | 1 | .408** | .541** | .538** | .398** |
| Careful | 4.30 | 1.48 | -.011 | .408** | 1 | .419** | .521** | .401** |
| Attention | 4.59 | 1.42 | .050 | .541** | .419** | 1 | .629** | .332** |
| Compliance | 4.48 | 1.56 | .036 | .538** | .521** | .629** | 1 | .423** |
| Representativeness | 4.00 | 1.40 | .088 | .398** | .401** | .332** | .423** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

N = 138

Table 2. Study 1 Multivariate Analysis of Variance Results

| | Wilks' λ Value | F | Hypothesis df | Error df | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | .892 | 2.634 | 6.000 | 131.000 | .019 | .108 | .845 |
| context | .667 | 10.896 | 6.000 | 131.000 | .000 | .333 | 1.000 |
| context * sex | .967 | 0.756 | 6.000 | 131.000 | .606 | .033 | .291 |
| illegality | .258 | 29.991 | 12.000 | 125.000 | .000 | .742 | 1.000 |
| illegality * sex | .932 | 0.765 | 12.000 | 125.000 | .685 | .068 | .426 |
| prohibitive | .166 | 52.156 | 12.000 | 125.000 | .000 | .834 | 1.000 |
| prohibitive * sex | .899 | 1.176 | 12.000 | 125.000 | .307 | .101 | .646 |
| actions | .160 | 34.817 | 18.000 | 119.000 | .000 | .840 | 1.000 |
| actions * sex | .802 | 1.628 | 18.000 | 119.000 | .064 | .198 | .913 |
| context * illegality | .590 | 7.234 | 12.000 | 125.000 | .000 | .410 | 1.000 |
| context * illegality * sex | .902 | 1.126 | 12.000 | 125.000 | .345 | .098 | .621 |
| context * prohibitive | .803 | 2.56 | 12.000 | 125.000 | .005 | .197 | .968 |
| context * prohibitive * sex | .952 | 0.53 | 12.000 | 125.000 | .892 | .048 | .290 |
| illegality * prohibitive | .293 | 11.343 | 24.000 | 113.000 | .000 | .707 | 1.000 |
| illegality * prohibitive * sex | .801 | 1.17 | 24.000 | 113.000 | .285 | .199 | .837 |
| context * illegality * prohibitive | .797 | 1.202 | 24.000 | 113.000 | .256 | .203 | .850 |
| context * illegality * prohibitive * sex | .846 | 0.859 | 24.000 | 113.000 | .655 | .154 | .666 |
| context * actions | .688 | 2.993 | 18.000 | 119.000 | .000 | .312 | .998 |
| context * actions * sex | .877 | 0.93 | 18.000 | 119.000 | .544 | .123 | .633 |
| illegality * actions | .238 | 8.989 | 36.000 | 101.000 | .000 | .762 | 1.000 |
| illegality * actions * sex | .729 | 1.042 | 36.000 | 101.000 | .423 | .271 | .865 |
| context * illegality * actions | .464 | 3.246 | 36.000 | 101.000 | .000 | .536 | 1.000 |
| context * illegality * actions * sex | .715 | 1.118 | 36.000 | 101.000 | .325 | .285 | .895 |
| prohibitive * actions | .175 | 13.183 | 36.000 | 101.000 | .000 | .825 | 1.000 |
| prohibitive * actions * sex | .648 | 1.522 | 36.000 | 101.000 | .053 | .352 | .978 |
| context * prohibitive * actions | .487 | 2.955 | 36.000 | 101.000 | .000 | .513 | 1.000 |
| context * prohibitive * actions * sex | .709 | 1.15 | 36.000 | 101.000 | .289 | .291 | .906 |
| illegality * prohibitive * actions | .213 | 3.335 | 72.000 | 65.000 | .000 | .787 | 1.000 |
| illegality * prohibitive * actions * sex | .513 | 0.856 | 72.000 | 65.000 | .741 | .487 | .829 |
| context * illegality * prohibitive * actions | .313 | 1.983 | 72.000 | 65.000 | .003 | .687 | 1.000 |
| context * illegality * prohibitive * actions * sex | .428 | 1.207 | 72.000 | 65.000 | .221 | .572 | .961 |

Table 3. Study 1 Univariate ANOVA Examining Interpretability

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 23.552 | 1 | 23.552 | 5.404 | .022 | .038 | .636 |
| Error 1 | 592.677 | 136 | 4.358 | | | | |
| | | | | | | | |
| context | 3.238 | 1 | 3.238 | 29.296 | .000 | .177 | 1.000 |
| context * sex | .056 | 1 | .056 | .506 | .478 | .004 | .109 |
| Error 2 | 15.033 | 136 | .111 | | | | |
| illegality | 29.459 | 1.743 | 16.903 | 42.520 | .000 | .238 | 1.000 |
| illegality * sex | .020 | 1.743 | .011 | .029 | .958 | .000 | .054 |
| Error 3 | 94.225 | 237.034 | .398 | | | | |
| prohibitive | 184.856 | 1.169 | 158.089 | 217.377 | .000 | .615 | 1.000 |
| prohibitive * sex | 3.682 | 1.169 | 3.149 | 4.330 | .033 | .031 | .585 |
| Error 4 | 115.653 | 159.027 | .727 | | | | |
| actions | 261.985 | 1.767 | 148.281 | 210.102 | .000 | .607 | 1.000 |
| actions * sex | 6.540 | 3 | 2.180 | 5.245 | .001 | .037 | .927 |
| Error 5 | 169.584 | 240.287 | .706 | | | | |
| context * illegality | 2.461 | 1.767 | 1.393 | 15.191 | .000 | .100 | .998 |
| context * illegality * sex | .147 | 1.767 | .083 | .905 | .395 | .007 | .195 |
| Error 6 | 22.029 | 240.299 | .092 | | | | |
| context * prohibitive | .165 | 2 | .083 | 1.319 | .269 | .010 | .284 |
| context * prohibitive * sex | .180 | 2 | .090 | 1.435 | .240 | .010 | .306 |
| Error 7 | 17.049 | 272 | .063 | | | | |
| illegality * prohibitive | 47.320 | 2.795 | 16.929 | 76.690 | .000 | .361 | 1.000 |
| illegality * prohibitive * sex | 1.824 | 2.795 | .653 | 2.956 | .036 | .021 | .677 |
| Error 8 | 83.916 | 380.144 | .221 | | | | |
| context * illegality * prohibitive | 1.549 | 3.505 | .442 | 6.129 | .000 | .043 | .978 |
| context * illegality * prohibitive * sex | .161 | 3.505 | .046 | .638 | .615 | .005 | .197 |
| Error 9 | 34.376 | 476.721 | .072 | | | | |
| context * actions | .706 | 3.000 | .235 | 3.540 | .015 | .025 | .784 |
| context * actions * sex | .415 | 3 | .138 | 2.080 | .102 | .015 | .531 |
| Error 10 | 27.108 | 408 | .066 | | | | |
| illegality * actions | 4.235 | 5.416 | .782 | 8.905 | .000 | .061 | 1.000 |
| illegality * actions * sex | .838 | 5.416 | .155 | 1.761 | .112 | .013 | .634 |
| Error 11 | 64.687 | 736.557 | .088 | | | | |
| context * illegality * actions | 4.971 | 5.471 | .909 | 13.016 | .000 | .087 | 1.000 |
| context * illegality * actions * sex | .619 | 5.471 | .113 | 1.620 | .146 | .012 | .595 |
| Error 12 | 51.944 | 744.057 | .070 | | | | |
| prohibitive * actions | 103.983 | 3.502 | 29.696 | 151.100 | .000 | .526 | 1.000 |
| prohibitive * actions * sex | 2.773 | 3.502 | .792 | 4.030 | .005 | .029 | .881 |
| Error 13 | 93.591 | 476.209 | .197 | | | | |
| context * prohibitive * actions | 6.395 | 5.610 | 1.140 | 18.820 | .000 | .122 | 1.000 |
| context * prohibitive * actions * sex | .254 | 5.610 | .045 | .749 | .602 | .005 | .289 |
| Error 14 | 46.210 | 763.012 | .061 | | | | |
| illegality * prohibitive * actions | 13.687 | 8.970 | 1.526 | 17.277 | .000 | .113 | 1.000 |
| illegality * prohibitive * actions * sex | 1.876 | 8.970 | .209 | 2.368 | .012 | .017 | .921 |
| Error 15 | 107.742 | 1219.963 | .088 | | | | |
| context * illegality * prohibitive * actions | 8.005 | 10.568 | .758 | 10.487 | .000 | .072 | 1.000 |
| context * illegality * prohibitive * actions * sex | 1.586 | 10.568 | .150 | 2.078 | .021 | .015 | .914 |
| Error 16 | 103.812 | 1437.240 | .072 | | | | |
| Total | 2357.175 | 9798 | | | | | |

Table 4. Study 1 Univariate ANOVA Examining Understandability.

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 1591.019 | 1 | 1591.019 | 9.330 | .003 | .064 | .858 |
| Error 1 | 23191.328 | 136 | 170.524 | | | | |
| | | | | | | | |
| context | 3.781 | 1 | 3.781 | 1.452 | .230 | .011 | .223 |
| context * sex | 1.440 | 1 | 1.440 | .553 | .458 | .004 | .114 |
| Error 2 | 354.122 | 136 | 2.604 | | | | |
| illegality | 3502.341 | 1.756 | 1994.680 | 125.214 | .000 | .479 | 1.000 |
| illegality * sex | 2.323 | 1.756 | 1.323 | .083 | .898 | .001 | .062 |
| Error 3 | 3804.023 | 238.794 | 15.930 | | | | |
| prohibitive | 118.447 | 1.467 | 80.738 | 9.477 | .001 | .065 | .942 |
| prohibitive * sex | 12.283 | 1.467 | 8.372 | .983 | .354 | .007 | .193 |
| Error 4 | 1699.781 | 199.520 | 8.519 | | | | |
| actions | 2574.810 | 1.710 | 1506.147 | 56.628 | .000 | .294 | 1.000 |
| actions * sex | 92.764 | 1.710 | 54.263 | 2.040 | .140 | .015 | .385 |
| Error 5 | 6183.782 | 232.497 | 26.597 | | | | |
| context * illegality | 35.621 | 2 | 17.810 | 9.621 | .000 | .066 | .981 |
| context * illegality * sex | .347 | 2 | .173 | .094 | .911 | .001 | .064 |
| Error 6 | 503.538 | 272 | 1.851 | | | | |
| context * prohibitive | 3.942 | 2 | 1.971 | 1.419 | .244 | .010 | .303 |
| context * prohibitive * sex | 2.860 | 2 | 1.430 | 1.030 | .359 | .008 | .229 |
| Error 7 | 377.804 | 272 | 1.389 | | | | |
| illegality * prohibitive | 281.150 | 2.548 | 110.347 | 21.626 | .000 | .137 | 1.000 |
| illegality * prohibitive * sex | 9.118 | 2.548 | 3.579 | .701 | .529 | .005 | .185 |
| Error 8 | 1768.052 | 346.511 | 5.102 | | | | |
| context * illegality * prohibitive | 7.630 | 4 | 1.907 | 1.424 | .225 | .010 | .444 |
| context * illegality * prohibitive * sex | 7.653 | 4 | 1.913 | 1.429 | .223 | .010 | .446 |
| Error 9 | 728.519 | 544 | 1.339 | | | | |
| context * actions | 18.412 | 2.900 | 6.349 | 5.041 | .002 | .036 | .909 |
| context * actions * sex | 2.044 | 2.900 | .705 | .560 | .636 | .004 | .163 |
| Error 10 | 496.694 | 394.365 | 1.259 | | | | |
| illegality * actions | 1078.070 | 4.144 | 260.146 | 83.671 | .000 | .381 | 1.000 |
| illegality * actions * sex | 31.334 | 4.144 | 7.561 | 2.432 | .044 | .018 | .710 |
| Error 11 | 1752.306 | 563.598 | 3.109 | | | | |
| context * illegality * actions | 33.876 | 6 | 5.646 | 4.603 | .000 | .033 | .988 |
| context * illegality * actions * sex | 6.854 | 6 | 1.142 | .931 | .472 | .007 | .373 |
| Error 12 | 1000.936 | 816 | 1.227 | | | | |
| prohibitive * actions | 30.610 | 5.107 | 5.994 | 3.163 | .007 | .023 | .888 |
| prohibitive * actions * sex | 6.620 | 5.107 | 1.296 | .684 | .639 | .005 | .252 |
| Error 13 | 1316.037 | 694.526 | 1.895 | | | | |
| context * prohibitive * actions | 7.121 | 5.718 | 1.245 | 1.008 | .417 | .007 | .392 |
| context * prohibitive * actions * sex | 4.853 | 5.718 | .849 | .687 | .653 | .005 | .269 |
| Error 14 | 960.519 | 777.596 | 1.235 | | | | |
| illegality * prohibitive * actions | 74.990 | 10.977 | 6.831 | 4.139 | .000 | .030 | .999 |
| illegality * prohibitive * actions * sex | 12.994 | 10.977 | 1.184 | .717 | .723 | .005 | .408 |
| Error 15 | 2464.257 | 1492.896 | 1.651 | | | | |
| context * illegality * prohibitive * actions | 30.270 | 11.391 | 2.657 | 1.966 | .026 | .014 | .913 |
| context * illegality * prohibitive * actions * sex | 6.949 | 11.391 | .610 | .451 | .937 | .003 | .258 |
| Error 16 | 2093.871 | 1549.219 | 1.352 | | | | |
| Total | 58288.09 | 9798 | | | | | |

Table 5. Study 1 Univariate ANOVA Examining Attention.

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 125.203 | 1 | 125.203 | 0.843 | .360 | .006 | .149 |
| Error 1 | 20209.972 | 136 | 148.603 | | | | |
| context | 116.672 | 1 | 116.672 | 14.215 | .000 | .095 | .963 |
| context * sex | 1.535 | 1 | 1.535 | .187 | .666 | .001 | .071 |
| Error 2 | 1116.265 | 136 | 8.208 | | | | |
| illegality | 612.192 | 1.704 | 359.164 | 20.455 | .000 | .131 | 1.000 |
| illegality * sex | 22.449 | 1.704 | 13.170 | .750 | .454 | .005 | .166 |
| Error 3 | 4070.242 | 231.811 | 17.558 | | | | |
| prohibitive | 1621.832 | 1.392 | 1165.526 | 73.111 | .000 | .350 | 1.000 |
| prohibitive * sex | 13.911 | 1.392 | 9.997 | .627 | .480 | .005 | .136 |
| Error 4 | 3016.891 | 189.244 | 15.942 | | | | |
| actions | 29.477 | 1.946 | 15.151 | 1.727 | .181 | .013 | .356 |
| actions * sex | 7.445 | 1.946 | 3.826 | .436 | .641 | .003 | .120 |
| Error 5 | 2321.476 | 264.592 | 8.774 | | | | |
| context * illegality | 20.854 | 2 | 10.427 | 8.049 | .000 | .056 | .956 |
| context * illegality * sex | 2.807 | 2 | 1.404 | 1.084 | .340 | .008 | .239 |
| Error 6 | 352.341 | 272 | 1.295 | | | | |
| context * prohibitive | 8.510 | 2 | 4.255 | 3.074 | .048 | .022 | .590 |
| context * prohibitive * sex | .469 | 2 | .235 | .169 | .844 | .001 | .076 |
| Error 7 | 376.523 | 272 | 1.384 | | | | |
| illegality * prohibitive | 25.428 | 3.555 | 7.152 | 3.592 | .009 | .026 | .841 |
| illegality * prohibitive * sex | 2.950 | 3.555 | .830 | .417 | .774 | .003 | .141 |
| Error 8 | 962.704 | 483.520 | 1.991 | | | | |
| context * illegality * prohibitive | 2.873 | 4 | .718 | .627 | .644 | .005 | .206 |
| context * illegality * prohibitive * sex | 9.423 | 4 | 2.356 | 2.055 | .085 | .015 | .614 |
| Error 9 | 623.581 | 544 | 1.146 | | | | |
| context * actions | 7.965 | 2.897 | 2.749 | 2.058 | .108 | .015 | .517 |
| context * actions * sex | 7.015 | 2.897 | 2.421 | 1.813 | .146 | .013 | .462 |
| Error 10 | 526.297 | 394.048 | 1.336 | | | | |
| illegality * actions | 35.780 | 4.870 | 7.347 | 4.088 | .001 | .029 | .951 |
| illegality * actions * sex | 4.621 | 4.870 | .949 | .528 | .750 | .004 | .194 |
| Error 11 | 1190.216 | 662.295 | 1.797 | | | | |
| context * illegality * actions | 14.046 | 5.675 | 2.475 | 1.887 | .085 | .014 | .686 |
| context * illegality * actions * sex | 2.315 | 5.675 | .408 | .311 | .924 | .002 | .135 |
| Error 12 | 1012.469 | 771.757 | 1.312 | | | | |
| prohibitive * actions | 38.651 | 5.255 | 7.354 | 4.200 | .001 | .030 | .967 |
| prohibitive * actions * sex | 11.539 | 5.255 | 2.196 | 1.254 | .281 | .009 | .461 |
| Error 13 | 1251.410 | 714.739 | 1.751 | | | | |
| context * prohibitive * actions | 9.187 | 5.881 | 1.562 | 1.233 | .288 | .009 | .484 |
| context * prohibitive * actions * sex | 7.667 | 5.881 | 1.304 | 1.029 | .404 | .008 | .406 |
| Error 14 | 1013.356 | 799.761 | 1.267 | | | | |
| illegality * prohibitive * actions | 21.005 | 10.372 | 2.025 | 1.423 | .161 | .010 | .741 |
| illegality * prohibitive * actions * sex | 16.003 | 10.372 | 1.543 | 1.084 | .371 | .008 | .593 |
| Error 15 | 2007.945 | 1410.581 | 1.423 | | | | |
| context * illegality * prohibitive * actions | 14.608 | 11.031 | 1.324 | .978 | .465 | .007 | .558 |
| context * illegality * prohibitive * actions * sex | 11.309 | 11.031 | 1.025 | .757 | .684 | .006 | .433 |
| Error 16 | 2032.344 | 1500.272 | 1.355 | | | | |
| Total | 44909.74 | 9798 | | | | | |

Table 6. Study 1 Univariate ANOVA Examining Carefulness.

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 485.065 | 1 | 485.065 | 3.069 | .082 | .022 | .413 |
| Error 1 | 21495.402 | 136 | 158.054 | | | | |
| | | | | | | | |
| context | 22.893 | 1 | 22.893 | 8.727 | .004 | .060 | .835 |
| context * sex | .100 | 1 | .100 | .038 | .846 | .000 | .054 |
| Error 2 | 356.763 | 136 | 2.623 | | | | |
| illegality | 2858.846 | 2 | 1429.423 | 55.740 | .000 | .291 | 1.000 |
| illegality * sex | 114.402 | 2 | 57.201 | 2.231 | .109 | .016 | .453 |
| Error 3 | 6975.279 | 272 | 25.644 | | | | |
| prohibitive | 4293.762 | 1.243 | 3453.323 | 146.330 | .000 | .518 | 1.000 |
| prohibitive * sex | 13.981 | 1.243 | 11.244 | .476 | .532 | .003 | .111 |
| Error 4 | 3990.660 | 169.098 | 23.600 | | | | |
| actions | 170.426 | 1.415 | 120.426 | 10.315 | .000 | .070 | .953 |
| actions * sex | 11.216 | 1.415 | 7.926 | .679 | .460 | .005 | .145 |
| Error 5 | 2247.086 | 192.466 | 11.675 | | | | |
| context * illegality | 1.528 | 2 | .764 | .521 | .594 | .004 | .135 |
| context * illegality * sex | 3.557 | 2 | 1.779 | 1.213 | .299 | .009 | .264 |
| Error 6 | 398.749 | 272 | 1.466 | | | | |
| context * prohibitive | .704 | 2 | .352 | .254 | .776 | .002 | .090 |
| context * prohibitive * sex | 3.254 | 2 | 1.627 | 1.174 | .311 | .009 | .256 |
| Error 7 | 376.864 | 272 | 1.386 | | | | |
| illegality * prohibitive | 326.936 | 2.949 | 110.864 | 25.232 | .000 | .156 | 1.000 |
| illegality * prohibitive * sex | 15.665 | 2.949 | 5.312 | 1.209 | .306 | .009 | .321 |
| Error 8 | 1762.146 | 401.063 | 4.394 | | | | |
| context * illegality * prohibitive | .205 | 4 | .051 | .040 | .997 | .000 | .058 |
| context * illegality * prohibitive * sex | 5.086 | 4 | 1.272 | .983 | .416 | .007 | .312 |
| Error 9 | 703.415 | 544 | 1.293 | | | | |
| context * actions | 1.850 | 2.882 | .642 | .451 | .709 | .003 | .139 |
| context * actions * sex | 1.075 | 2.882 | .373 | .262 | .845 | .002 | .099 |
| Error 10 | 557.474 | 391.942 | 1.422 | | | | |
| illegality * actions | 8.134 | 5.270 | 1.544 | .925 | .467 | .007 | .344 |
| illegality * actions * sex | 6.249 | 5.270 | 1.186 | .711 | .623 | .005 | .266 |
| Error 11 | 1195.735 | 716.708 | 1.668 | | | | |
| context * illegality * actions | 6.600 | 5.864 | 1.126 | .814 | .557 | .006 | .322 |
| context * illegality * actions * sex | 10.937 | 5.864 | 1.865 | 1.348 | .234 | .010 | .525 |
| Error 12 | 1103.353 | 797.444 | 1.384 | | | | |
| prohibitive * actions | 36.594 | 5.095 | 7.182 | 3.616 | .003 | .026 | .930 |
| prohibitive * actions * sex | 5.915 | 5.095 | 1.161 | .584 | .715 | .004 | .217 |
| Error 13 | 1376.414 | 692.937 | 1.986 | | | | |
| context * prohibitive * actions | 18.272 | 5.729 | 3.189 | 2.105 | .054 | .015 | .745 |
| context * prohibitive * actions * sex | 3.011 | 5.729 | .526 | .347 | .905 | .003 | .147 |
| Error 14 | 1180.730 | 779.184 | 1.515 | | | | |
| illegality * prohibitive * actions | 17.177 | 10.892 | 1.577 | 1.044 | .404 | .008 | .589 |
| illegality * prohibitive * actions * sex | 15.371 | 10.892 | 1.411 | .935 | .505 | .007 | .531 |
| Error 15 | 2236.806 | 1481.322 | 1.510 | | | | |
| context * illegality * prohibitive * actions | 12.346 | 11.227 | 1.100 | .818 | .624 | .006 | .473 |
| context * illegality * prohibitive * actions * sex | 23.481 | 11.227 | 2.091 | 1.556 | .104 | .011 | .812 |
| Error 16 | 2052.355 | 1526.826 | 1.344 | | | | |
| Total | 56503.87 | 9798 | | | | | |

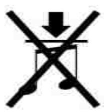
Table 7. Study 1 Univariate ANOVA Examining Compliance.

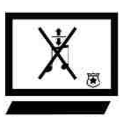
| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 58.642 | 1 | 58.642 | .325 | .569 | .002 | .413 |
| Error 1 | 24504.798 | 136 | 180.182 | | | | |
| | | | | | | | |
| context | 1.779 | 1 | 1.779 | .591 | .443 | .004 | .119 |
| context * sex | 10.772 | 1 | 10.772 | 3.580 | .061 | .026 | .468 |
| Error 2 | 409.198 | 136 | 3.009 | | | | |
| illegality | 507.579 | 1.930 | 263.058 | 14.352 | .000 | .095 | .998 |
| illegality * sex | 53.149 | 1.930 | 27.545 | 1.503 | .225 | .011 | .313 |
| Error 3 | 4809.918 | 262.416 | 18.329 | | | | |
| prohibitive | 184.963 | 1.170 | 158.132 | 3.394 | .061 | .024 | .485 |
| prohibitive * sex | 5.130 | 1.170 | 4.386 | .094 | .799 | .001 | .061 |
| Error 4 | 7410.669 | 159.076 | 46.586 | | | | |
| actions | 377.948 | 1.658 | 227.953 | 11.247 | .000 | .076 | .982 |
| actions * sex | 46.855 | 1.658 | 28.260 | 1.394 | .249 | .010 | .272 |
| Error 5 | 4570.280 | 225.489 | 20.268 | | | | |
| context * illegality | 12.119 | 2 | 6.060 | 3.426 | .034 | .025 | .640 |
| context * illegality * sex | 10.383 | 2 | 5.192 | 2.935 | .055 | .021 | .569 |
| Error 6 | 481.123 | 272 | 1.769 | | | | |
| context * prohibitive | 1.230 | 2 | .615 | .367 | .693 | .003 | .109 |
| context * prohibitive * sex | .011 | 2 | .005 | .003 | .997 | .000 | .050 |
| Error 7 | 456.209 | 272 | 1.677 | | | | |
| illegality * prohibitive | 416.389 | 2.621 | 158.860 | 23.469 | .000 | .147 | 1.000 |
| illegality * prohibitive * sex | 18.714 | 2.621 | 7.140 | 1.055 | .363 | .008 | .267 |
| Error 8 | 2412.975 | 356.472 | 6.769 | | | | |
| context * illegality * prohibitive | 3.635 | 3.784 | .961 | .670 | .605 | .005 | .213 |
| context * illegality * prohibitive * sex | 2.488 | 3.784 | .658 | .459 | .756 | .003 | .155 |
| Error 9 | 737.785 | 514.558 | 1.434 | | | | |
| context * actions | 7.810 | 2.867 | 2.724 | 1.641 | .182 | .012 | .420 |
| context * actions * sex | .608 | 2.867 | .212 | .128 | .938 | .001 | .073 |
| Error 10 | 647.412 | 389.928 | 1.660 | | | | |
| illegality * actions | 138.583 | 4.424 | 31.326 | 11.254 | .000 | .076 | 1.000 |
| illegality * actions * sex | 12.890 | 4.424 | 2.914 | 1.047 | .386 | .008 | .351 |
| Error 11 | 1674.775 | 601.656 | 2.784 | | | | |
| context * illegality * actions | 6.957 | 5.509 | 1.263 | .729 | .615 | .005 | .279 |
| context * illegality * actions * sex | 7.395 | 5.509 | 1.342 | .775 | .580 | .006 | .296 |
| Error 12 | 1297.956 | 749.197 | 1.732 | | | | |
| prohibitive * actions | 17.644 | 5.023 | 3.512 | 1.464 | .199 | .011 | .519 |
| prohibitive * actions * sex | 20.428 | 5.023 | 4.067 | 1.695 | .133 | .012 | .591 |
| Error 13 | 1638.830 | 683.172 | 2.399 | | | | |
| context * prohibitive * actions | 10.075 | 5.789 | 1.740 | 1.176 | .317 | .009 | .459 |
| context * prohibitive * actions * sex | 13.243 | 5.789 | 2.288 | 1.546 | .163 | .011 | .590 |
| Error 14 | 1164.675 | 787.274 | 1.479 | | | | |
| illegality * prohibitive * actions | 66.006 | 10.514 | 6.278 | 3.489 | .000 | .025 | .995 |
| illegality * prohibitive * actions * sex | 31.117 | 10.514 | 2.960 | 1.645 | .085 | .012 | .819 |
| Error 15 | 2572.896 | 1429.870 | 1.799 | | | | |
| context * illegality * prohibitive * actions | 19.143 | 11.022 | 1.737 | 1.120 | .341 | .008 | .631 |
| context * illegality * prohibitive * actions * sex | 19.849 | 11.022 | 1.801 | 1.161 | .309 | .008 | .651 |
| Error 16 | 2324.364 | 1498.983 | 1.551 | | | | |
| Total | 59197.4 | 9798 | | | | | |

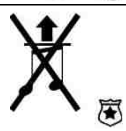
Table 8.  Study 1 Univariate ANOVA Examining Representativeness.

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 480.543 | 1 | 480.543 | 3.408 | .067 | 0.024 | 0.450 |
| Error 1 | 19176.547 | 136 | 141.004 | | | | |
| context | 33.094 | 1 | 33.094 | 14.114 | .000 | .094 | .962 |
| context * sex | 3.646 | 1 | 3.646 | 1.555 | .215 | .011 | .236 |
| Error 2 | 318.891 | 136 | 2.345 | | | | |
| illegality | 2736.374 | 2 | 1368.187 | 73.896 | .000 | .352 | 1.000 |
| illegality * sex | 54.910 | 2 | 27.455 | 1.483 | .229 | .011 | .315 |
| Error 3 | 5036.069 | 272 | 18.515 | | | | |
| prohibitive | 10745.522 | 1.147 | 9371.306 | 382.105 | .000 | .738 | 1.000 |
| prohibitive * sex | 185.826 | 1.147 | 162.062 | 6.608 | .008 | .046 | .764 |
| Error 4 | 3824.579 | 155.943 | 24.525 | | | | |
| actions | 1434.881 | 2.538 | 565.299 | 70.959 | .000 | .343 | 1.000 |
| actions * sex | 107.000 | 2.538 | 42.155 | 5.291 | .003 | .037 | .895 |
| Error 5 | 2750.107 | 345.204 | 7.967 | | | | |
| context * illegality | 4.023 | 2 | 2.011 | 1.565 | .211 | .011 | .331 |
| context * illegality * sex | 1.418 | 2 | .709 | .552 | .577 | .004 | .141 |
| Error 6 | 349.650 | 272 | 1.285 | | | | |
| context * prohibitive | 20.720 | 2 | 10.360 | 7.708 | .001 | .054 | .947 |
| context * prohibitive * sex | .427 | 2 | .213 | .159 | .853 | .001 | .074 |
| Error 7 | 365.576 | 272 | 1.344 | | | | |
| illegality * prohibitive | 32.133 | 3.349 | 9.595 | 2.410 | .059 | .017 | .635 |
| illegality * prohibitive * sex | 2.464 | 3.349 | .736 | .185 | .923 | .001 | .086 |
| Error 8 | 1813.519 | 455.445 | 3.982 | | | | |
| context * illegality * prohibitive | 1.313 | 4 | .328 | .280 | .891 | .002 | .112 |
| context * illegality * prohibitive * sex | 2.246 | 4 | .561 | .479 | .751 | .004 | .164 |
| Error 9 | 637.632 | 544 | 1.172 | | | | |
| context * actions | 3.576 | 3 | 1.192 | .893 | .445 | .007 | .246 |
| context * actions * sex | 2.739 | 3 | .913 | .684 | .562 | .005 | .195 |
| Error 10 | 544.819 | 408 | 1.335 | | | | |
| illegality * actions | 31.271 | 6 | 5.212 | 3.593 | .002 | .026 | .955 |
| illegality * actions * sex | 19.706 | 6 | 3.284 | 2.264 | .036 | .016 | .795 |
| Error 11 | 1183.685 | 816 | 1.451 | | | | |
| context * illegality * actions | 10.623 | 6 | 1.771 | 1.441 | .196 | .010 | .565 |
| context * illegality * actions * sex | 4.518 | 6 | .753 | .613 | .720 | .004 | .247 |
| Error 12 | 1002.561 | 816 | 1.229 | | | | |
| prohibitive * actions | 140.741 | 4.315 | 32.616 | 11.048 | .000 | .075 | 1.000 |
| prohibitive * actions * sex | 32.064 | 4.315 | 7.431 | 2.517 | .036 | .018 | .740 |
| Error 13 | 1732.578 | 586.856 | 2.952 | | | | |
| context * prohibitive * actions | .591 | 5.566 | .106 | .086 | .997 | .001 | .070 |
| context * prohibitive * actions * sex | 3.382 | 5.566 | .608 | .493 | .801 | .004 | .195 |
| Error 14 | 932.803 | 756.972 | 1.232 | | | | |
| illegality * prohibitive * actions | 55.414 | 11.038 | 5.020 | 3.282 | .000 | .024 | .994 |
| illegality * prohibitive * actions * sex | 14.073 | 11.038 | 1.275 | .834 | .607 | .006 | .478 |
| Error 15 | 2295.905 | 1501.107 | 1.529 | | | | |
| context * illegality * prohibitive * actions | 11.480 | 11.298 | 1.016 | .822 | .621 | .006 | .477 |
| context * illegality * prohibitive * actions * sex | 12.291 | 11.298 | 1.088 | .880 | .562 | .006 | .511 |
| Error 16 | 1899.367 | 1536.505 | 1.236 | | | | |
| Total | 60053.3 | 9798 | | | | | |

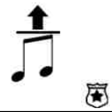
Table 9. Study 1 Comprehension:  95% Confidence Interval (CI) Rates

| | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| Icon | | lower | M | upper | lower | M | upper | SD |
| 26 |  | 0.55 | 61.6 | 0.68 | 4.65 | 5.08 | 5.50 | 2.526 |
| 62 |  | 0.55 | 61.6 | 0.68 | 5.02 | 5.43 | 5.83 | 2.416 |
| 25 |  | 0.55 | 61.2 | 0.68 | 4.42 | 4.83 | 5.23 | 2.395 |
| 66 |  | 0.54 | 60.7 | 0.67 | 4.58 | 4.96 | 5.35 | 2.284 |
| 50 |  | 0.55 | 59.4 | 0.66 | 3.76 | 4.13 | 4.50 | 2.211 |
| 14 |  | 0.52 | 58.5 | 0.65 | 3.74 | 4.11 | 4.48 | 2.191 |
| 29 |  | 0.52 | 58 | 0.65 | 4.08 | 4.49 | 4.90 | 2.438 |
| 65 |  | 0.52 | 58 | 0.65 | 4.27 | 4.69 | 5.10 | 2.461 |
| 61 |  | 0.51 | 57.6 | 0.64 | 4.63 | 5.03 | 5.43 | 2.395 |
| 30 |  | 0.51 | 57.1 | 0.64 | 4.49 | 4.90 | 5.31 | 2.417 |
| 49 |  | 0.50 | 56.7 | 0.63 | 3.55 | 3.91 | 4.26 | 2.096 |

| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 2 |  | 0.50 | 56.3 | 0.63 | 4.36 | 4.78 | 5.19 | 2.476 |
| 63 |  | 0.50 | 56.3 | 0.63 | 4.06 | 4.47 | 4.88 | 2.426 |
| 13 |  | 0.49 | 55.4 | 0.62 | 3.49 | 3.85 | 4.21 | 2.134 |
| 5 |  | 0.48 | 54.9 | 0.61 | 3.85 | 4.23 | 4.61 | 2.265 |
| 1 |  | 0.48 | 54.5 | 0.61 | 3.94 | 4.34 | 4.74 | 2.378 |
| 6 |  | 0.48 | 54.5 | 0.61 | 4.09 | 4.46 | 4.84 | 2.212 |
| 7 |  | 0.48 | 54.5 | 0.61 | 3.65 | 4.04 | 4.43 | 2.321 |
| 18 |  | 0.48 | 54.5 | 0.61 | 3.64 | 4.01 | 4.39 | 2.211 |
| 54 |  | 0.48 | 54.5 | 0.61 | 3.66 | 4.01 | 4.37 | 2.134 |
| 42 |  | 0.47 | 54 | 0.61 | 4.15 | 4.55 | 4.96 | 2.405 |
| 37 |  | 0.47 | 53.6 | 0.60 | 4.06 | 4.46 | 4.85 | 2.328 |
| 38 |  | 0.47 | 53.6 | 0.60 | 4.34 | 4.74 | 5.14 | 2.369 |

| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 3 |  | 0.47 | 53.1 | 0.60 | 3.81 | 4.20 | 4.59 | 2.309 |
| 53 |  | 0.45 | 51.8 | 0.58 | 3.47 | 3.82 | 4.17 | 2.069 |
| 67 |  | 0.45 | 51.8 | 0.58 | 4.01 | 4.42 | 4.83 | 2.10 |
| 17 |  | 0.45 | 51.3 | 0.58 | 3.58 | 3.96 | 4.34 | 2.252 |
| 27 |  | 0.45 | 51.3 | 0.58 | 4.29 | 4.72 | 5.15 | 2.543 |
| 51 |  | 0.45 | 51.3 | 0.58 | 3.31 | 3.66 | 4.01 | 2.056 |
| 41 |  | 0.44 | 50.4 | 0.57 | 3.83 | 4.20 | 4.58 | 2.238 |
| 15 |  | 0.43 | 49.1 | 0.56 | 3.47 | 3.85 | 4.23 | 2.244 |
| 39 |  | 0.43 | 49.1 | 0.56 | 3.84 | 4.23 | 4.62 | 2.331 |
| 19 |  | 0.42 | 48.2 | 0.55 | 3.53 | 3.91 | 4.28 | 2.221 |
| 31 |  | 0.42 | 48.2 | 0.55 | 4.03 | 4.42 | 4.81 | 2.308 |
| 55 |  | 0.40 | 46.4 | 0.53 | 3.25 | 3.59 | 3.94 | 2.067 |

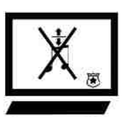
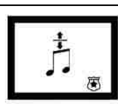
| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 22 |  | 0.31 | 37.5 | 0.44 | 3.49 | 3.86 | 4.22 | 2.193 |
| 21 |  | 0.29 | 35.3 | 0.42 | 3.48 | 3.83 | 4.18 | 2.081 |
| 57 |  | 0.28 | 33.9 | 0.40 | 3.47 | 3.84 | 4.21 | 2.172 |
| 23 |  | 0.23 | 29.5 | 0.35 | 3.21 | 3.56 | 3.91 | 2.068 |
| 59 |  | 0.22 | 28.1 | 0.34 | 3.15 | 3.49 | 3.83 | 2.030 |
| 58 |  | 0.21 | 27.2 | 0.33 | 3.55 | 3.93 | 4.30 | 2.227 |
| 16 |  | 0.16 | 21.4 | 0.27 | 4.05 | 4.43 | 4.82 | 2.260 |
| 10 |  | 0.15 | 20.5 | 0.26 | 3.74 | 4.09 | 4.45 | 2.110 |
| 24 |  | 0.14 | 19.6 | 0.25 | 3.90 | 4.27 | 4.64 | 2.210 |
| 56 |  | 0.14 | 18.8 | 0.24 | 3.89 | 4.26 | 4.63 | 2.196 |
| 60 |  | 0.14 | 18.8 | 0.24 | 3.46 | 3.85 | 4.24 | 2.308 |
| 11 |  | 0.13 | 18.3 | 0.23 | 3.26 | 3.61 | 3.96 | 2.059 |

| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 45 |  | 0.13 | 18.3 | 0.23 | 3.52 | 3.87 | 4.22 | 2.099 |
| 47 |  | 0.13 | 17.9 | 0.23 | 3.21 | 3.53 | 3.85 | 1.888 |
| 9 |  | 0.12 | 16.5 | 0.21 | 3.43 | 3.78 | 4.12 | 2.036 |
| 12 |  | 0.12 | 16.5 | 0.21 | 4.35 | 4.76 | 5.17 | 2.430 |
| 20 |  | 0.11 | 15.6 | 0.20 | 3.97 | 4.35 | 4.73 | 2.272 |
| 48 |  | 0.10 | 14.7 | 0.19 | 3.96 | 4.36 | 4.77 | 2.401 |
| 43 |  | 0.10 | 14.3 | 0.19 | 3.65 | 4.01 | 4.38 | 2.155 |
| 44 |  | 0.06 | 9.8 | 0.16 | 4.55 | 4.93 | 5.32 | 2.296 |
| 8 |  | 0.04 | 7.6 | 0.11 | 4.60 | 4.99 | 5.37 | 2.299 |
| 4 |  | 0.01 | 3.6 | 0.06 | 4.62 | 5.03 | 5.43 | 2.407 |
| 40 |  | 0.00 | 3.1 | 0.05 | 4.75 | 5.16 | 5.57 | 2.417 |
| 34 |  | 0.00 | 2.2 | 0.04 | 4.76 | 5.18 | 5.60 | 2.483 |

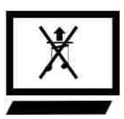
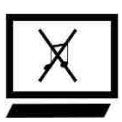
| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 28 |  | 0.00 | 1.3 | 0.03 | 6.42 | 6.78 | 7.14 | 2.130 |
| 32 |  | 0.00 | 1.3 | 0.03 | 5.94 | 6.30 | 6.67 | 2.163 |
| 35 |  | 0.00 | 1.3 | 0.03 | 4.03 | 4.43 | 4.84 | 2.383 |
| 46 |  | 0.00 | 0.9 | 0.02 | 3.66 | 4.03 | 4.40 | 2.221 |
| 52 |  | 0.00 | 0.9 | 0.02 | 4.31 | 4.69 | 5.07 | 2.260 |
| 64 |  | 0.00 | 0.9 | 0.02 | 6.88 | 7.25 | 7.61 | 2.151 |
| 33 |  | 0.00 | 0.4 | 0.01 | 4.60 | 5.01 | 5.43 | 2.443 |
| 68 |  | 0.00 | 0.4 | 0.01 | 6.28 | 6.64 | 7.01 | 2.157 |
| 69 |  | 0.00 | 0.4 | 0.01 | 4.60 | 5.01 | 5.41 | 2.391 |
| 71 |  | 0.00 | 0.4 | 0.01 | 4.04 | 4.41 | 4.79 | 2.240 |
| 36 |  | 0.00 | 0 | 0.00 | 6.79 | 7.14 | 7.49 | 2.086 |
| 70 |  | 0.00 | 0 | 0.00 | 5.10 | 5.51 | 5.93 | 2.492 |

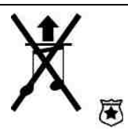
| Icon | | CI Interpretability | | | Understandability | | | |
|---|---|---|---|---|---|---|---|---|
| | | lower | M | upper | lower | M | upper | SD |
| 72 |  | 0.00 | 0 | 0.00 | 7.70 | 7.99 | 8.27 | 1.704 |

Table 10.  Study 1 Dependent Variables Means and SDs

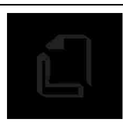
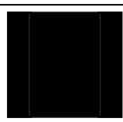
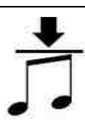
| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 1 |  | 5.35 | 2.48 | 5.38 | 2.235 | 4.87 | 2.55 | 5.21 | 2.26 |
| 2 |  | 5.64 | 2.43 | 5.45 | 2.549 | 5.00 | 2.55 | 5.91 | 2.22 |
| 3 |  | 5.57 | 2.41 | 5.33 | 2.254 | 4.57 | 2.58 | 5.96 | 2.43 |
| 4 |  | 5.20 | 2.38 | 5.38 | 2.287 | 5.03 | 2.48 | 5.03 | 2.50 |
| 5 |  | 5.07 | 2.39 | 5.14 | 2.256 | 4.67 | 2.45 | 5.04 | 2.31 |
| 6 |  | 5.35 | 2.49 | 5.21 | 2.36 | 4.57 | 2.52 | 5.57 | 2.38 |
| 7 |  | 5.22 | 2.47 | 5.33 | 2.316 | 4.71 | 2.54 | 5.48 | 2.33 |
| 8 |  | 5.21 | 2.45 | 5.31 | 2.231 | 4.81 | 2.42 | 4.54 | 2.36 |
| 9 |  | 4.14 | 2.34 | 4.51 | 1.945 | 4.52 | 2.24 | 2.88 | 1.95 |
| 10 |  | 4.12 | 2.31 | 4.64 | 1.992 | 4.81 | 2.34 | 3.31 | 2.17 |
| 11 |  | 4.02 | 2.34 | 4.66 | 2.129 | 4.43 | 2.43 | 3.12 | 2.16 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 12 |  | 3.62 | 2.19 | 4.23 | 2.169 | 4.77 | 2.59 | 2.69 | 1.86 |
| 13 |  | 4.97 | 2.23 | 4.91 | 2.154 | 4.04 | 2.28 | 5.14 | 2.38 |
| 14 |  | 5.03 | 2.24 | 4.95 | 2.173 | 4.32 | 2.43 | 5.56 | 2.34 |
| 15 |  | 5.02 | 2.36 | 5.09 | 2.164 | 3.91 | 2.38 | 5.51 | 2.40 |
| 16 |  | 4.71 | 2.27 | 5.09 | 2.231 | 4.49 | 2.37 | 4.41 | 2.36 |
| 17 |  | 4.66 | 2.29 | 4.78 | 2.082 | 4.15 | 2.31 | 4.82 | 2.12 |
| 18 |  | 4.83 | 2.24 | 4.81 | 2.115 | 4.07 | 2.33 | 5.17 | 2.20 |
| 19 |  | 4.83 | 2.25 | 4.52 | 2.058 | 3.91 | 2.19 | 5.30 | 2.26 |
| 20 |  | 4.65 | 2.31 | 4.75 | 2.089 | 4.30 | 2.40 | 4.33 | 2.36 |
| 21 |  | 3.91 | 2.20 | 4.01 | 1.757 | 4.23 | 2.22 | 2.89 | 2.09 |
| 22 |  | 3.97 | 2.13 | 4.14 | 1.976 | 4.30 | 2.23 | 3.09 | 2.14 |
| 23 |  | 3.99 | 2.28 | 4.20 | 1.914 | 4.11 | 2.25 | 3.24 | 2.10 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 24 |  | 3.78 | 2.38 | 4.01 | 2.079 | 4.41 | 2.44 | 2.44 | 1.76 |
| 25 |  | 4.33 | 2.10 | 4.72 | 1.959 | 4.22 | 2.29 | 4.09 | 2.08 |
| 26 |  | 4.70 | 2.24 | 4.86 | 2.131 | 4.21 | 2.23 | 4.91 | 2.31 |
| 27 |  | 4.23 | 2.20 | 4.70 | 1.939 | 3.92 | 2.27 | 4.57 | 2.21 |
| 28 |  | 4.16 | 2.17 | 5.17 | 2.170 | 4.66 | 2.56 | 3.41 | 2.24 |
| 29 |  | 4.14 | 2.23 | 4.51 | 2.051 | 4.14 | 2.25 | 4.02 | 1.98 |
| 30 |  | 4.39 | 2.29 | 4.52 | 1.953 | 4.17 | 2.37 | 4.57 | 2.25 |
| 31 |  | 4.14 | 2.10 | 4.30 | 1.958 | 3.85 | 2.18 | 4.26 | 2.16 |
| 32 |  | 3.85 | 2.04 | 4.53 | 2.048 | 4.49 | 2.53 | 3.17 | 2.06 |
| 33 |  | 2.59 | 1.89 | 3.63 | 2.029 | 4.67 | 2.64 | 1.91 | 1.53 |
| 34 |  | 2.51 | 1.85 | 3.82 | 1.869 | 5.14 | 2.58 | 1.87 | 1.53 |
| 35 |  | 2.46 | 1.80 | 3.61 | 1.866 | 4.50 | 2.483 | 1.78 | 1.48 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 36 |  | 2.07 | 1.98 | 3.79 | 2.341 | 5.87 | 2.72 | 1.54 | 1.45 |
| 37 |  | 5.33 | 2.45 | 4.93 | 2.202 | 4.64 | 2.537 | 5.26 | 2.31 |
| 38 |  | 5.48 | 2.33 | 5.28 | 2.264 | 4.99 | 2.452 | 5.81 | 2.17 |
| 39 |  | 5.37 | 2.46 | 5.17 | 2.220 | 4.67 | 2.535 | 5.71 | 2.54 |
| 40 |  | 5.17 | 2.40 | 5.24 | 2.183 | 5.05 | 2.453 | 4.72 | 2.47 |
| 41 |  | 5.17 | 2.35 | 4.83 | 2.095 | 4.56 | 2.444 | 4.99 | 2.24 |
| 42 |  | 5.12 | 2.41 | 4.81 | 2.213 | 4.70 | 2.539 | 5.42 | 2.35 |
| 43 |  | 5.22 | 2.39 | 4.59 | 2.143 | 4.45 | 2.509 | 5.31 | 2.26 |
| 44 |  | 4.97 | 2.36 | 4.99 | 2.117 | 4.80 | 2.431 | 4.31 | 2.28 |
| 45 |  | 3.96 | 2.25 | 4.30 | 2.041 | 4.64 | 2.330 | 3.06 | 2.12 |
| 46 |  | 4.02 | 2.34 | 4.33 | 1.979 | 4.72 | 2.435 | 3.36 | 2.13 |
| 47 |  | 3.91 | 2.30 | 4.10 | 1.983 | 4.56 | 2.352 | 3.08 | 2.07 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 48 |  | 3.52 | 2.24 | 4.18 | 2.132 | 4.57 | 2.485 | 2.73 | 2.05 |
| 49 |  | 4.76 | 2.25 | 4.64 | 1.981 | 4.14 | 2.362 | 4.79 | 2.34 |
| 50 |  | 4.99 | 2.32 | 4.85 | 2.043 | 4.38 | 2.396 | 5.25 | 2.23 |
| 51 |  | 4.91 | 2.29 | 4.76 | 2.017 | 4.22 | 2.446 | 5.25 | 2.33 |
| 52 |  | 4.72 | 2.22 | 4.79 | 2.049 | 4.28 | 2.330 | 4.40 | 2.32 |
| 53 |  | 4.70 | 2.12 | 4.61 | 2.012 | 3.93 | 3.971 | 4.66 | 2.14 |
| 54 |  | 4.76 | 2.16 | 4.51 | 1.942 | 4.13 | 2.273 | 4.93 | 1.99 |
| 55 |  | 4.84 | 2.32 | 4.27 | 1.882 | 3.97 | 2.29 | 5.00 | 2.38 |
| 56 |  | 4.54 | 2.22 | 4.31 | 1.970 | 4.43 | 2.361 | 4.09 | 2.11 |
| 57 |  | 3.83 | 2.14 | 4.04 | 1.977 | 4.06 | 2.137 | 2.92 | 2.01 |
| 58 |  | 4.08 | 2.26 | 4.13 | 1.917 | 4.26 | 2.080 | 3.14 | 2.17 |
| 59 |  | 3.96 | 2.22 | 3.93 | 1.745 | 4.02 | 2.268 | 3.04 | 2.21 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 60 |  | 3.51 | 2.16 | 3.60 | 1.912 | 4.41 | 2.579 | 2.41 | 1.81 |
| 61 |  | 4.18 | 2.19 | 4.64 | 1.844 | 4.14 | 2.301 | 4.14 | 2.20 |
| 62 |  | 4.43 | 2.03 | 4.85 | 2.068 | 4.35 | 2.400 | 4.85 | 2.18 |
| 63 |  | 4.12 | 1.96 | 4.70 | 1.894 | 4.14 | 2.255 | 4.52 | 2.12 |
| 64 |  | 4.17 | 2.19 | 4.95 | 2.183 | 4.99 | 2.694 | 3.13 | 1.84 |
| 65 |  | 4.11 | 2.12 | 4.40 | 1.790 | 4.01 | 2.211 | 3.72 | 1.95 |
| 66 |  | 3.91 | 2.00 | 4.38 | 1.861 | 4.28 | 2.302 | 4.39 | 1.99 |
| 67 |  | 4.17 | 2.00 | 4.01 | 1.782 | 4.01 | 2.262 | 4.12 | 2.03 |
| 68 |  | 4.00 | 2.19 | 4.44 | 2.121 | 4.66 | 2.536 | 3.01 | 2.03 |
| 69 |  | 2.38 | 1.74 | 3.55 | 1.918 | 4.85 | 2.619 | 1.99 | 1.82 |
| 70 |  | 2.51 | 1.87 | 3.72 | 1.995 | 5.10 | 2.659 | 1.84 | 1.48 |
| 71 |  | 2.43 | 1.88 | 3.50 | 1.829 | 4.71 | 2.544 | 1.99 | 1.67 |

| Icon | | Carefulness | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 72 |  | 1.72 | 1.58 | 3.93 | 2.545 | 6.22 | 2.757 | 1.41 | 1.14 |

Table 11. Flesch-Kincaid reading indexes for proposed warning messages reading ease and grade level ratings.

| Message Number | Warning Message | Flesch Reading Ease | Flesch-Kincaid Grade Level |
|---|---|---|---|
| 1. | This is illegal. | 62.8 | 5.2 |
| 2. | This is illegal. You may be fined. | 118.2 | 6.4 |
| 3. | This is illegal. You may be monitored. | 75.9 | 4.3 |
| 4. | This is illegal. You may be monitored and fined. | 88 | 3.2 |

Table 12. Study 2 Correlations of Dependent Variables.

| Study 2: Correlations of dependent variables. | | | | | | | |
|---|---|---|---|---|---|---|---|
| Dependent Variables | M | SD | 1 | 2 | 3 | 4 | 5 |
| Understandability | 5.06 | 1.66 | 1 | .434** | .518** | .466** | .565** |
| Carefulness | 4.97 | 1.52 | .434** | 1 | .724** | .777** | .472** |
| Attention | 4.89 | 1.37 | .518** | .724** | 1 | .696** | .496** |
| Compliance | 4.63 | 1.63 | .466** | .777** | .696** | 1 | .507** |
| Representativeness | 4.78 | 1.54 | .565** | .472** | .496** | .507** | 1 |

** Correlation is significant at the 0.01 level (2-tailed).
N=220

Table 13. Study 2 Means and Standard Deviations for 4 Top Best Performing Icons

| | | | | Understandability | | Careful | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| icon | Signal Word | Information | Consequences | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 1 | control | | | 3.22 | 2.021 | 2.62 | 1.920 | 2.87 | 1.942 | 2.32 | 1.666 | 3.13 | 1.952 |
| 1 | stop | | | 3.96 | 2.097 | 3.04 | 1.802 | 3.55 | 1.764 | 2.79 | 1.751 | 3.43 | 1.972 |
| 1 | stop | This is illegal | | 4.98 | 2.193 | 4.57 | 2.133 | 4.63 | 1.982 | 4.07 | 2.128 | 4.34 | 2.089 |
| 1 | stop | This is illegal | You may be fined | 5.49 | 2.388 | 5.91 | 2.126 | 5.66 | 1.962 | 5.45 | 2.338 | 5.28 | 2.259 |
| 1 | stop | This is illegal | You may be monitored | 5.54 | 2.212 | 5.70 | 2.159 | 5.59 | 2.019 | 5.30 | 2.369 | 5.08 | 2.269 |
| 1 | stop | This is illegal | You may be monitored and fined | 5.97 | 2.51 | 6.48 | 2.38 | 6.34 | 2.23 | 6.15 | 2.47 | 5.75 | 2.54 |
| 1 | important | | | 3.61 | 2.08 | 3.00 | 1.88 | 3.46 | 1.84 | 2.68 | 1.69 | 3.37 | 1.91 |
| 1 | important | This is illegal | | 4.90 | 2.14 | 4.55 | 2.20 | 4.72 | 1.94 | 4.12 | 2.10 | 4.49 | 2.09 |
| 1 | important | This is illegal | You may be fined | 5.47 | 2.27 | 5.86 | 2.18 | 5.72 | 2.02 | 5.59 | 2.37 | 5.30 | 2.28 |
| 1 | important | This is illegal | You may be monitored | 5.53 | 2.29 | 5.77 | 2.19 | 5.65 | 2.05 | 5.32 | 2.34 | 5.26 | 2.27 |
| 1 | important | This is illegal | You may be monitored and fined | 6.05 | 2.48 | 6.41 | 2.29 | 6.26 | 2.21 | 6.01 | 2.56 | 5.85 | 2.46 |
| 1 | notice | | | 3.60 | 2.06 | 2.89 | 1.91 | 3.16 | 1.82 | 2.63 | 1.75 | 3.21 | 1.95 |
| 1 | notice | This is illegal | | 4.77 | 2.17 | 4.39 | 2.12 | 4.51 | 1.93 | 4.16 | 2.02 | 4.30 | 1.94 |
| 1 | notice | This is illegal | You may be fined | 5.53 | 2.29 | 5.72 | 2.25 | 5.53 | 2.00 | 5.53 | 2.28 | 5.14 | 2.29 |
| 1 | notice | This is illegal | You may be monitored | 5.36 | 2.22 | 5.62 | 2.18 | 5.50 | 2.01 | 5.30 | 2.27 | 5.18 | 2.23 |
| 1 | notice | This is illegal | You may be monitored and fined | 6.00 | 2.44 | 6.38 | 2.35 | 6.25 | 2.24 | 6.11 | 2.48 | 5.68 | 2.57 |
| 2 | control | | | 3.64 | 2.19 | 2.54 | 1.75 | 2.84 | 1.87 | 2.44 | 1.80 | 3.30 | 1.95 |
| 2 | stop | | | 4.19 | 2.18 | 3.27 | 1.97 | 3.69 | 1.78 | 3.06 | 1.88 | 3.73 | 2.00 |
| 2 | stop | This is illegal | | 5.31 | 2.15 | 4.81 | 2.16 | 4.65 | 1.90 | 4.29 | 2.07 | 4.85 | 2.05 |
| 2 | stop | This is illegal | You may be fined | 5.90 | 2.27 | 6.05 | 2.12 | 5.72 | 1.93 | 5.57 | 2.25 | 5.77 | 2.07 |

| | | | | Understandability | | Careful | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| icon | Signal Word | Information | Consequences | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 2 | stop | This is illegal | You may be monitored | 5.83 | 2.15 | 5.84 | 2.13 | 5.62 | 1.95 | 5.43 | 2.22 | 5.71 | 2.15 |
| 2 | stop | This is illegal | You may be monitored and fined | 6.29 | 2.38 | 6.77 | 2.09 | 6.50 | 2.08 | 6.40 | 2.39 | 6.36 | 2.27 |
| 2 | important | | | 3.95 | 2.14 | 3.07 | 1.89 | 3.60 | 1.83 | 2.98 | 1.88 | 3.64 | 1.82 |
| 2 | important | This is illegal | | 5.10 | 2.14 | 4.66 | 2.05 | 4.66 | 1.79 | 4.35 | 2.16 | 4.95 | 1.99 |
| 2 | important | This is illegal | You may be fined | 5.95 | 2.17 | 6.03 | 2.12 | 5.75 | 2.02 | 5.72 | 2.24 | 5.72 | 2.09 |
| 2 | important | This is illegal | You may be monitored | 6.05 | 2.16 | 5.90 | 2.08 | 5.72 | 2.00 | 5.50 | 2.24 | 5.67 | 2.16 |
| 2 | important | This is illegal | You may be monitored and fined | 6.47 | 2.24 | 6.68 | 2.13 | 6.44 | 2.11 | 6.33 | 2.39 | 6.35 | 2.38 |
| 2 | notice | | | 3.91 | 2.13 | 2.95 | 1.71 | 3.40 | 1.84 | 2.86 | 1.98 | 3.58 | 1.96 |
| 2 | notice | This is illegal | | 5.16 | 2.07 | 4.58 | 2.05 | 4.62 | 1.83 | 4.20 | 2.16 | 4.70 | 1.91 |
| 2 | notice | This is illegal | You may be fined | 5.75 | 2.16 | 6.03 | 2.08 | 5.64 | 1.98 | 5.69 | 2.20 | 5.55 | 2.04 |
| 2 | notice | This is illegal | You may be monitored | 5.87 | 2.14 | 5.98 | 1.95 | 5.57 | 2.03 | 5.43 | 2.24 | 5.55 | 2.14 |
| 2 | notice | This is illegal | You may be monitored and fined | 6.28 | 2.35 | 6.67 | 2.18 | 6.37 | 2.14 | 6.30 | 2.33 | 6.34 | 2.29 |
| 3 | control | | | 3.60 | 2.14 | 2.58 | 1.87 | 2.89 | 1.91 | 2.52 | 1.95 | 3.25 | 1.98 |
| 3 | stop | | | 4.16 | 2.19 | 3.09 | 1.87 | 3.55 | 1.78 | 2.89 | 1.80 | 3.59 | 2.03 |
| 3 | stop | This is illegal | | 5.14 | 2.14 | 4.58 | 2.10 | 4.56 | 1.82 | 4.26 | 2.01 | 4.55 | 1.97 |
| 3 | stop | This is illegal | You may be fined | 5.76 | 2.12 | 5.95 | 2.01 | 5.73 | 1.94 | 5.68 | 2.17 | 5.54 | 2.15 |
| 3 | stop | This is illegal | You may be monitored | 5.74 | 2.16 | 5.89 | 2.09 | 5.71 | 1.85 | 5.46 | 2.16 | 5.49 | 2.12 |
| 3 | stop | This is illegal | You may be monitored and fined | 6.21 | 2.21 | 6.71 | 2.09 | 6.33 | 2.05 | 6.32 | 2.25 | 5.99 | 2.36 |
| 3 | important | | | 3.71 | 2.15 | 3.04 | 1.89 | 3.41 | 1.78 | 2.81 | 1.77 | 3.47 | 1.84 |
| 3 | important | This is illegal | | 5.08 | 2.13 | 4.67 | 2.09 | 4.52 | 1.80 | 4.33 | 2.13 | 4.54 | 1.82 |
| 3 | important | This is illegal | You may be fined | 5.71 | 2.16 | 5.97 | 2.02 | 5.77 | 1.91 | 5.54 | 2.21 | 5.50 | 2.06 |
| 3 | important | This is illegal | You may be monitored | 5.74 | 1.99 | 5.81 | 1.96 | 5.55 | 1.79 | 5.45 | 2.05 | 5.41 | 1.96 |
| 3 | important | This is illegal | You may be monitored and fined | 6.14 | 2.24 | 6.59 | 2.12 | 6.31 | 2.11 | 6.20 | 2.23 | 6.00 | 2.29 |
| 3 | notice | | | 3.68 | 2.06 | 2.97 | 1.83 | 3.46 | 1.82 | 2.76 | 1.80 | 3.31 | 1.85 |

| | | | | Understandability | | Careful | | Attention | | Compliance | | Representativeness | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| icon | Signal Word | Information | Consequences | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 3 | notice | This is illegal | | 5.10 | 2.06 | 4.48 | 2.03 | 4.40 | 1.86 | 4.22 | 2.10 | 4.51 | 1.88 |
| 3 | notice | This is illegal | You may be fined | 5.68 | 2.17 | 5.88 | 2.07 | 5.62 | 1.94 | 5.54 | 2.19 | 5.43 | 2.04 |
| 3 | notice | This is illegal | You may be monitored | 5.64 | 2.11 | 5.83 | 2.06 | 5.51 | 1.94 | 5.34 | 2.17 | 5.38 | 2.15 |
| 3 | notice | This is illegal | You may be monitored and fined | 6.14 | 2.33 | 6.53 | 2.18 | 6.18 | 2.05 | 6.07 | 2.33 | 5.98 | 2.26 |
| 4 | control | | | 3.16 | 2.20 | 2.44 | 1.77 | 2.54 | 1.83 | 2.16 | 1.68 | 2.75 | 1.95 |
| 4 | stop | | | 3.76 | 2.20 | 3.10 | 1.89 | 3.32 | 1.84 | 2.91 | 1.94 | 3.36 | 1.92 |
| 4 | stop | This is illegal | | 4.54 | 2.16 | 4.44 | 2.10 | 4.23 | 1.88 | 4.02 | 2.07 | 4.28 | 2.00 |
| 4 | stop | This is illegal | You may be fined | 5.15 | 2.27 | 5.73 | 2.20 | 5.35 | 2.12 | 5.31 | 2.26 | 4.98 | 2.20 |
| 4 | stop | This is illegal | You may be monitored | 5.22 | 2.26 | 5.51 | 2.15 | 5.16 | 2.04 | 5.19 | 2.24 | 4.95 | 2.05 |
| 4 | stop | This is illegal | You may be monitored and fined | 5.73 | 2.36 | 6.31 | 2.33 | 5.76 | 2.27 | 5.75 | 2.44 | 5.44 | 2.34 |
| 4 | important | | | 3.53 | 2.14 | 2.88 | 1.76 | 3.13 | 1.76 | 2.70 | 1.81 | 3.15 | 1.84 |
| 4 | important | This is illegal | | 4.61 | 2.22 | 4.48 | 2.05 | 4.32 | 1.99 | 4.08 | 2.13 | 4.22 | 1.90 |
| 4 | important | This is illegal | You may be fined | 5.26 | 2.20 | 5.63 | 2.22 | 5.40 | 2.01 | 5.16 | 2.31 | 5.07 | 2.09 |
| 4 | important | This is illegal | You may be monitored | 5.28 | 2.24 | 5.61 | 2.12 | 5.23 | 2.10 | 5.22 | 2.19 | 5.10 | 2.07 |
| 4 | important | This is illegal | You may be monitored and fined | 5.44 | 2.37 | 6.41 | 2.20 | 5.82 | 2.18 | 5.79 | 2.38 | 5.57 | 2.26 |
| 4 | notice | | | 3.29 | 2.02 | 2.67 | 1.81 | 3.05 | 1.66 | 2.56 | 1.65 | 3.09 | 1.78 |
| 4 | notice | This is illegal | | 4.57 | 2.15 | 4.30 | 2.01 | 4.11 | 1.82 | 3.95 | 2.04 | 4.12 | 1.87 |
| 4 | notice | This is illegal | You may be fined | 5.06 | 2.33 | 5.64 | 2.23 | 5.11 | 2.06 | 5.15 | 2.24 | 4.92 | 2.11 |
| 4 | notice | This is illegal | You may be monitored | 5.17 | 2.19 | 5.40 | 2.09 | 5.21 | 2.00 | 5.06 | 2.20 | 4.83 | 2.06 |
| 4 | notice | This is illegal | You may be monitored and fined | 5.72 | 2.37 | 6.30 | 2.32 | 5.69 | 2.26 | 5.81 | 2.36 | 5.43 | 2.27 |

Table 14.  Study 2 MANOVA

| Source | Wilks' λ Value | F | Hypothesis df | Error df | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| **Between Subjects** | | | | | | | |
| sex | 0.971 | 1.272 | 5.000 | 214.000 | 0.277 | 0.029 | 0.447 |
| **Within Subjects** | | | | | | | |
| icon | 0.634 | 7.846 | 15.000 | 204.000 | 0.000 | 0.366 | 1.000 |
| icon * sex | 0.904 | 1.439 | 15.000 | 204.000 | 0.132 | 0.096 | 0.838 |
| signal | 0.778 | 5.966 | 10.000 | 209.000 | 0.000 | 0.222 | 1.000 |
| signal * sex | 0.971 | 0.623 | 10.000 | 209.000 | 0.794 | 0.029 | 0.321 |
| message | 0.240 | 31.56 | 20.000 | 199.000 | 0.000 | 0.760 | 1.000 |
| message * sex | 0.929 | 0.76 | 20.000 | 199.000 | 0.759 | 0.071 | 0.575 |
| icon * signal | 0.874 | 0.906 | 30.000 | 189.000 | 0.611 | 0.126 | 0.796 |
| icon * signal * sex | 0.869 | 0.951 | 30.000 | 189.000 | 0.545 | 0.131 | 0.822 |
| icon * message | 0.620 | 1.621 | 60.000 | 159.000 | 0.009 | 0.380 | 0.999 |
| icon * message * sex | 0.738 | 0.942 | 60.000 | 159.000 | 0.597 | 0.262 | 0.945 |
| signal * message | 0.697 | 1.946 | 40.000 | 179.000 | 0.002 | 0.303 | 0.999 |
| signal * message * sex | 0.804 | 1.093 | 40.000 | 179.000 | 0.340 | 0.196 | 0.938 |
| icon * signal * message | 0.456 | 0.986 | 120.000 | 99.000 | 0.532 | 0.544 | 0.980 |
| icon * signal * message * sex | 0.460 | 0.970 | 120.000 | 99.000 | 0.566 | 0.540 | 0.977 |

Table 15.  Study 2 Understandability ANOVA

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 206.538 | 1 | 206.538 | 1.211 | 0.272 | 0.006 | 0.195 |
| Error 1 | 37177.670 | 218 | 170.540 | | | | |
| | | | | | | | |
| icon | 672.937 | 2.532 | 265.820 | 26.954 | 0.000 | 0.110 | 1.000 |
| icon * sex | 54.338 | 2.532 | 21.464 | 2.176 | 0.101 | 0.010 | 0.505 |
| Error 2 | 5442.593 | 551.878 | 9.862 | | | | |
| signal | 27.434 | 1.613 | 17.006 | 7.295 | 0.002 | 0.032 | 0.893 |
| signal * sex | 3.368 | 1.613 | 2.088 | 0.896 | 0.390 | 0.004 | 0.187 |
| Error 3 | 819.820 | 351.678 | 2.331 | | | | |
| message | 7223.018 | 1.659 | 4355.127 | 206.277 | 0.000 | 0.486 | 1.000 |
| message * sex | 68.050 | 1.659 | 41.031 | 1.943 | 0.153 | 0.009 | 0.365 |
| Error 4 | 7633.503 | 361.555 | 21.113 | | | | |
| icon * signal | 5.628 | 5.761 | 0.977 | 0.848 | 0.529 | 0.004 | 0.332 |
| icon * signal * sex | 6.671 | 5.761 | 1.158 | 1.005 | 0.419 | 0.005 | 0.393 |
| Error 5 | 1447.738 | 1255.962 | 1.153 | | | | |
| icon * message | 24.709 | 10.561 | 2.340 | 1.625 | 0.089 | 0.007 | 0.815 |
| icon * message * sex | 15.049 | 10.561 | 1.425 | 0.989 | 0.452 | 0.005 | 0.552 |
| Error 6 | 3315.595 | 2302.223 | 1.440 | | | | |
| signal * message | 43.810 | 6.957 | 6.297 | 4.542 | 0.000 | 0.020 | 0.994 |
| signal * message * sex | 21.307 | 6.957 | 3.063 | 2.209 | 0.031 | 0.010 | 0.830 |
| Error 7 | 2102.772 | 1516.588 | 1.387 | | | | |
| icon * signal * message | 33.858 | 21.813 | 1.552 | 1.275 | 0.176 | 0.006 | 0.910 |
| icon * signal * message * sex | 26.478 | 21.813 | 1.214 | 0.997 | 0.464 | 0.005 | 0.800 |
| Error 8 | 5789.706 | 4755.336 | 1.218 | | | | |
| Total | 72162.59 | 12980 | | | | | |

Table 16. Study 2 Carefulness ANOVA

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| Sex | 5.639 | 1 | 5.639 | 0.038 | 0.845 | 0.000 | 0.054 |
| Error 1 | 32049.553 | 218 | 147.016 | | | | |
| | | | | | | | |
| icon | 195.700 | 2.527 | 77.451 | 14.313 | 0.000 | 0.062 | 1.000 |
| icon * sex | 2.202 | 2.527 | 0.871 | 0.161 | 0.895 | 0.001 | 0.078 |
| Error 2 | 2980.723 | 550.834 | 5.411 | | | | |
| signal | 35.948 | 1.848 | 19.448 | 11.077 | 0.000 | 0.048 | 0.988 |
| signal * sex | 0.744 | 1.848 | 0.402 | 0.229 | 0.778 | 0.001 | 0.085 |
| Error 3 | 707.499 | 402.954 | 1.756 | | | | |
| message | 18644.983 | 1.887 | 9880.157 | 371.066 | 0.000 | 0.630 | 1.000 |
| message * sex | 42.357 | 1.887 | 22.445 | 0.843 | 0.425 | 0.004 | 0.190 |
| Error 4 | 10953.855 | 411.391 | 26.626 | | | | |
| icon * signal | 3.141 | 6 | 0.523 | 0.592 | 0.737 | 0.003 | 0.240 |
| icon * signal * sex | 4.635 | 6 | 0.773 | 0.873 | 0.514 | 0.004 | 0.351 |
| Error 5 | 1156.978 | 1308 | 0.885 | | | | |
| icon * message | 14.483 | 10.881 | 1.331 | 1.208 | 0.276 | 0.006 | 0.670 |
| icon * message * sex | 9.385 | 10.881 | 0.863 | 0.783 | 0.656 | 0.004 | 0.445 |
| Error 6 | 2613.345 | 2371.968 | 1.102 | | | | |
| signal * message | 13.344 | 7.553 | 1.767 | 1.733 | 0.091 | 0.008 | 0.739 |
| signal * message * sex | 8.347 | 7.553 | 1.105 | 1.084 | 0.371 | 0.005 | 0.496 |
| Error 7 | 1678.590 | 1646.610 | 1.019 | | | | |
| icon * signal * message | 21.964 | 21.665 | 1.014 | 1.022 | 0.431 | 0.005 | 0.811 |
| icon * signal * message * sex | 31.593 | 21.665 | 1.458 | 1.471 | 0.074 | 0.007 | 0.951 |
| Error 8 | 4683.136 | 4723.009 | 0.992 | | | | |
| Total | 75858.14 | 12980 | | | | | |

Table 17. Study 2 Attention ANOVA

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| Sex | 146.982 | 1 | 146.982 | 1.243 | 0.266 | 0.006 | 0.199 |
| Error 1 | 25776.933 | 218 | 118.243 | | | | |
| icon | 400.402 | 2.088 | 191.744 | 25.995 | 0.000 | 0.107 | 1.000 |
| icon * sex | 13.096 | 2.088 | 6.272 | 0.850 | 0.432 | 0.004 | 0.200 |
| Error 2 | 3357.899 | 455.230 | 7.376 | | | | |
| signal | 47.605 | 1.885 | 25.257 | 14.501 | 0.000 | 0.062 | 0.998 |
| signal * sex | 1.210 | 1.885 | 0.642 | 0.368 | 0.679 | 0.002 | 0.108 |
| Error 3 | 715.694 | 410.895 | 1.742 | | | | |
| message | 11230.172 | 1.720 | 6528.693 | 259.353 | 0.000 | 0.543 | 1.000 |
| message * sex | 151.003 | 1.720 | 87.786 | 3.487 | 0.038 | 0.016 | 0.604 |
| Error 4 | 9439.567 | 374.987 | 25.173 | | | | |
| icon * signal | 4.917 | 6 | 0.819 | 0.824 | 0.552 | 0.004 | 0.331 |
| icon * signal * sex | 6.676 | 6 | 1.113 | 1.118 | 0.349 | 0.005 | 0.447 |
| Error 5 | 1301.397 | 1308 | 0.995 | | | | |
| icon * message | 36.582 | 11.431 | 3.200 | 2.848 | 0.001 | 0.013 | 0.987 |
| icon * message * sex | 11.093 | 11.431 | 0.970 | 0.864 | 0.579 | 0.004 | 0.506 |
| Error 6 | 2799.741 | 2492.016 | 1.123 | | | | |
| signal * message | 13.583 | 7.709 | 1.762 | 1.647 | 0.110 | 0.007 | 0.719 |
| signal * message * sex | 4.786 | 7.709 | 0.621 | 0.580 | 0.789 | 0.003 | 0.268 |
| Error 7 | 1797.666 | 1680.569 | 1.070 | | | | |
| icon * signal * message | 25.857 | 22.298 | 1.160 | 1.078 | 0.363 | 0.005 | 0.846 |
| icon * signal * message * sex | 31.320 | 22.298 | 1.405 | 1.306 | 0.152 | 0.006 | 0.923 |
| Error 8 | 5229.682 | 4860.867 | 1.076 | | | | |
| Total | 62543.86 | 12980 | | | | | |

Table 18. Study 2 Compliance ANOVA

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 119.183 | 1 | 119.183 | 0.704 | 0.402 | 0.003 | 0.133 |
| Error 1 | 36908.204 | 218 | 169.304 | | | | |
| | | | | | | | |
| icon | 238.156 | 2.416 | 98.568 | 18.363 | 0.000 | 0.078 | 1.000 |
| icon * sex | 7.283 | 2.416 | 3.014 | 0.562 | 0.603 | 0.003 | 0.153 |
| Error 2 | 2827.279 | 526.723 | 5.368 | | | | |
| signal | 15.815 | 1.665 | 9.497 | 3.614 | 0.036 | 0.016 | 0.611 |
| signal * sex | 0.878 | 1.665 | 0.527 | 0.201 | 0.778 | 0.001 | 0.079 |
| Error 3 | 953.973 | 363.032 | 2.628 | | | | |
| message | 16525.538 | 1.831 | 9023.017 | 364.686 | 0.000 | 0.626 | 1.000 |
| message * sex | 34.391 | 1.831 | 18.778 | 0.759 | 0.458 | 0.003 | 0.173 |
| Error 4 | 9878.540 | 399.264 | 24.742 | | | | |
| icon * signal | 8.092 | 5.831 | 1.388 | 1.352 | 0.232 | 0.006 | 0.527 |
| icon * signal * sex | 2.328 | 5.831 | 0.399 | 0.389 | 0.882 | 0.002 | 0.163 |
| Error 5 | 1304.724 | 1271.154 | 1.026 | | | | |
| icon * message | 38.815 | 11.022 | 3.522 | 3.127 | 0.000 | 0.014 | 0.992 |
| icon * message * sex | 12.301 | 11.022 | 1.116 | 0.991 | 0.452 | 0.005 | 0.566 |
| Error 6 | 2706.010 | 2402.860 | 1.126 | | | | |
| signal * message | 14.989 | 8 | 1.874 | 1.919 | 0.053 | 0.009 | 0.808 |
| signal * message * sex | 6.800 | 8 | 0.850 | 0.871 | 0.541 | 0.004 | 0.413 |
| Error 7 | 1702.662 | 1744 | 0.976 | | | | |
| icon * signal * message | 18.375 | 21.435 | 0.857 | 0.819 | 0.701 | 0.004 | 0.684 |
| icon * signal * message * sex | 12.529 | 21.435 | 0.584 | 0.559 | 0.948 | 0.003 | 0.471 |
| Error 8 | 4889.387 | 4672.874 | 1.046 | | | | |
| Total | 78226.25 | 12980 | | | | | |

Table 19. Study 2 Representativeness ANOVA

| Source | SS | df | MS | F | Sig. | Partial Eta Squared | Observed Power |
|---|---|---|---|---|---|---|---|
| sex | 393.260 | 1 | 393.260 | 2.639 | 0.106 | 0.012 | 0.366 |
| Error 1 | 32488.772 | 218 | 149.031 | | | | |
| | | | | | | | |
| icon | 692.838 | 2.289 | 302.668 | 24.334 | 0.000 | 0.100 | 1.000 |
| icon * sex | 44.979 | 2.289 | 19.649 | 1.580 | 0.204 | 0.007 | 0.360 |
| Error 2 | 6207.023 | 499.025 | 12.438 | | | | |
| signal | 37.638 | 1.891 | 19.906 | 13.187 | 0.000 | 0.057 | 0.997 |
| signal * sex | 1.867 | 1.891 | 0.987 | 0.654 | 0.512 | 0.003 | 0.156 |
| Error 3 | 622.229 | 412.203 | 1.510 | | | | |
| message | 8734.414 | 1.640 | 5324.903 | 236.598 | 0.000 | 0.520 | 1.000 |
| message * sex | 86.636 | 1.640 | 52.817 | 2.347 | 0.108 | 0.011 | 0.427 |
| Error 4 | 8047.830 | 357.584 | 22.506 | | | | |
| icon * signal | 6.078 | 6 | 1.013 | 0.971 | 0.443 | 0.004 | 0.390 |
| icon * signal * sex | 9.126 | 6 | 1.521 | 1.458 | 0.189 | 0.007 | 0.573 |
| Error 5 | 1364.171 | 1308 | 1.043 | | | | |
| icon * message | 38.411 | 11.267 | 3.409 | 3.085 | 0.000 | 0.014 | 0.992 |
| icon * message * sex | 24.618 | 11.267 | 2.185 | 1.977 | 0.026 | 0.009 | 0.913 |
| Error 6 | 2714.000 | 2456.287 | 1.105 | | | | |
| signal * message | 10.805 | 7.638 | 1.415 | 1.371 | 0.208 | 0.006 | 0.619 |
| signal * message * sex | 11.955 | 7.638 | 1.565 | 1.516 | 0.150 | 0.007 | 0.672 |
| Error 7 | 1718.739 | 1665.075 | 1.032 | | | | |
| icon * signal * message | 14.340 | 22.120 | 0.648 | 0.665 | 0.878 | 0.003 | 0.574 |
| icon * signal * message * sex | 23.102 | 22.120 | 1.044 | 1.071 | 0.371 | 0.005 | 0.840 |
| Error 8 | 4702.419 | 4822.146 | 0.975 | | | | |
| Total | 67995.25 | 12980 | | | | | |

**Bibliography**

Abdullah, R., & Hubner, R. (2006). *Pictograms Icons & Signs: A guide to information graphics*. Thames and Hudson, Inc.: New York, NY.

Adams, A., Bochner, S., & Bilik, L. (1998). The effectiveness of warning signs in hazardous work places: cognitive and social determinants. *Applied Ergonomics, 29*(4), 247-254. Retrieved from http://dx.doi.org/10/1016/S0003-6870(97)00047-1

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211. http://dx.doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2002). Perceived behavioral control, self efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, *32*(4), 665-683. http://dx.doi.org/10.1111/j.1559-1816.2002.tb00236.x

Allen, P. J., Sheperd, K. L., & Roberts, L. D. (2010). Peer-to-Peer File Sharing: Psychological Reactance and the Theory of Planned Behavior. *International Journal of Technoethics, 1*(4), 49-64.

Al-Rafee, S., & Cronan, T.P. (2006). Digital piracy: Factors that influence attitude toward behavior. *Journal of Business Ethics*, *63*, 237-259. doi: 10.1007/s10051-005-1902-9.

Al-Rafee, S., & Dashti, A.E. (2012). A cross cultural comparison of the extended TPB: The case of digital piracy. *Journal of Global Information Technology Management*, *15*(1). ISSN: 1097-198X.

Amer, T. S., & Maris, J. M. B. (2007). Signal words and signal icons in application control and information technology exception messages-hazard matching and habituation effects. *Journal of Information Systems*, *21*(2), 1-25. http://dx.doi.org/10.2308/jis.2007.21.2.1.

American National Standards Institute (2002). Product Safety Signs and Labels. Z535.4. Rosslyn, VA: National Electrical Manufacturers Association. Occupational Safety and Health Administration.

Davies, A. M., Waterman, S., White, R. C., & Davies, M. (2013). When you fail to see what you were told to look for: Inattentional blindness and task instructions. *Consciousness and Cognition*, *22*(1), 221-230. Retrieved from http://dx.doi.org/10/1016/j.concog.2012.11.015

Andrews, J. C. (1995). The effectiveness of alcohol warning labels: A review and extension. *American Behavioral Scientist, 38,* 622–632. http://dx.doi.org/10.1177/0002764295038004011

Ang, S. H., Cheng, P. S., Lim, E. A., & Tambyah, S. K. (2001). Spot the difference: Consumer responses towards counterfeits. *Journal of Consumer Marketing*, *18*(3), 219-235. http://dx.doi.org/10.1108/07363760110392967

Anthony, R. R. (2007). Innocent infringement in U.S. copyright law: A history. *Columbia Journal of Law and the Arts*, *30*(2), 133–184. http://ssrn.com/abstract=1153602.

Argo, J.J., & Main, K.J. (2004). Meta-analyses of the effectiveness of warning labels. *Journal of Public Policy and Marketing*, *23*(2), 193-208. http://dx.doi.org/10.1509/jppm.23.2.193.51400

Ariyabuddhiphongs, V. (2013). Problem gambling prevention: Before, during, and after measures. *International Journal of Mental Health Addiction*, *11*, 568-582. DOI: 10.1007/s11469-013-9429-2.

Arnstein, J. (1983). The international directory of graphic symbols. London: Kogan Page.

Avant, L., Thieman, A., Brewer, K. & Woodman, W. (1986). On the earliest perceptual operations of detecting and recognizing traffic signs. In A. G. Gale, M. H. Freeman, C. M. Haslegrave, P. Smith, S. P. Taylor (Eds.), *Vision in Vehicle* (253-258). Amsterdam: North-Holland.

Baldwin, C.L. & Runkle, R.S. (1967). Biohazards symbol: Development of a biological hazards warning signal. *Science New Series*, *158* (3798 ), 264-265. http://www.jstor.org/stable/1722446.

Banda, S.F. & Sichilongo, K. (2006). Analysis of the level of comprehension of chemical hazard labels: A case for Zambia. *Science of Total Environment, 363*, 22-27. doi:10.1016/j.scitotenv.2005.10.011

Barlow, T., & Wogalter, M.S. (1991). Increasing the surface area on small product containers to facilitate communication of label information and warnings. In: Proceedings of Interface 91. *Human Factors and Ergonomics Society*, Santa Monica, CA, pp. 88–93.

Beckerman, R. (2009). Content holders vs. the web: 2008 US copyright law victories point to robust Internet. *Journal of Internet Law*, January, 16-21. ISSN. 10942904

Bhattacharjee, S., Gopal, R.D., & Sanders, G.L. (2003). Digital music and online sharing: Software piracy 2.0? Considering the similarities and unique characteristics of online file sharing and software piracy. *Communications of the ACM*, *46*(7), 107-111. doi: 10.1145/792704.792707

Blattner, M. A., Sumikawa, D. A. and Greenberg, R. A. (1989). Earcons and icons: their structure and common design principles. *Human-computer interaction.* **4** (1), 11-40. doi:10.1207/s15327051hci0401_1

Bonner, S., & O'Higgins, E. (2010). Music piracy: Ethical perspectives. *Management Decision*, *48*(9), 1341-1354. doi.10.1108/00251741011082099.

Borja, K., & Dieringer, S. (2016). Streaming or Stealing? The complementary features between music streaming and music piracy. *Journal of Retailing and Consumer Services, 32*, 86-95. doi:http://dx.doi.org/10.1016/j.jretconser.2016.06.007

Borland, R., Wilson, N., & Fong, G.T. (2009). Impact of graphic and text warnings on cigarette packs: Findings from four countries over five years. *Tobacco Control*, *18*, 358-364. doi: 10.1136/tc.2008.028043.

Bowie, N. E. (2005). Digital rights and wrongs: intellectual property in the information age. *Business and Society Review*, *110*(1), 77-96.

Bzostek, J. A., & Wogalter, M. S. (1999). Measuring visual search time for a product warning label as a function of icon, color, column and vertical placement. *Proceedings of the 43rd Human Factors and Ergonomics Society Annual Meeting* (pp. 888-892). Santa Monica: Human Factors and Ergonomics Society.

Cahill, M.C. (1975). Interpretability of graphic symbols as a function of context and experience factors. *Journal of Applied Psychology*, 60(3), 376-380. http://dx.doi.org/10.1037/h0076624

Chan, K.L, Chen, K., & Chan, A.H.S. (2011). An analysis of the effects of personal and design factors on comprehensibility of safety signs. In Lin & Chen (Eds.), *Ergonomics For All: Celebrating PPCOE's 20 Years of Excellence* (209-214). London: Taylor & Francis. ISBN 978-0-415-58608-5.

Chatterjee, P. (2008). Are unclicked ads wasted? Enduring effects of banner and ad exposures on brand memory and attitudes. *Journal of Electronic Commerce Research*, *9*(1), 51-61.

Chaudhry, P.E., Chaudhry, S.S., Stumpf, S.A., & Sudler, H. (2011). Piracy in cyberspace: Consumer complicity, pirates and enterprise enforcement. *Enterprise Information Systems*, *5*(2), 255-271. doi: 10.1080/17517575.2010.524942.

Cheng, H., Sims, R., & Teegen, H. (1997). To purchase or to pirate software: An empirical study. *Journal of Management Information System*, *13*, 49–60. ISSN 07421222

Chiang, E., & Assane, D. (2002). Copyright Piracy on the university campus: Trends and lessons from the software and music industries. *The International Journal on Media Management*, *4*(3), 145-149.doi: 10.1080/14241270209389993

Chiang, E.P., & Assane, D. (2008). Music Piracy among students on the university campus: Do males and females react differently? *The Journal of Socio-Economics, 37*, 1371-1380. doi: 10.1016/j.socec.2008.08.011.

Childers, T. L., & Houston, M. J. (1984). Conditions for a Picture-Superiority Effect on Consumer Memory. *Journal of Consumer Research*, 11(2), 643. doi:10.1086/209001

Chiou, J. S., Huang, C.Y., & Lee, H.H. (2005). The antecedents of music piracy attitudes and intentions. *Journal of Business Ethics, 57*(2), 161–174. doi: 10.1007/s10551-004-5263-6

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Hillsdale, NJ: Lawrence Earlbaum Associates.

Condry, I. (2004). Cultures of Music Piracy: An Ethnographic Comparison of the US and Japan. *International Journal of Cultural Studies*, 7(3), 343–363. doi:10.1177/1367877904046412

*Copyright and the Public Domain*. (2017, January 4). Retrieved from Public Domain Information: www.pdinfo.com/coopyright-law/copyright-and-public-domain

Coyle, J.R., Gould, S.J., Gupta, P., & Reetika, G. (2009). "To buy or to pirate": The matrix of consumers' acquisition-mode decision-making. *Journal of Business Research, 62*, 1031-1037.

Crockett, R. O. (1999). A web that looks like the world. *Business Week*. Retrieved May 23, 2012 from http://ezproxy.library.unlv.edu/login?url=http://search.proquest.com/docview/236715720?accountid=3611.

Cummings, A. S. (2010). From Monopoly to Intellectual Property: Music Piracy and the Remaking of American Copyright, 1909-1971. *Journal of American History*, 97(3), 659–681. doi:10.1093/jahist/97.3.659.

Danaher, B., Smith, M., Telangh, R., & Chen, S. (2014). The effect of graduated response anti-piracy laws on music sales: evidence from an even study in France. *The Journal of Industrial Economics, 62*(3), 541-552.

D' Astous, A., Colbert, F., & Montpetit, D. (2005). Music Piracy on the Web – How Effective are Anti-Piracy Arguments? Evidence from the Theory of Planned Behaviour. *Journal of Consumer Policy*, 28(3), 289–310. doi:10.1007/s10603-005-8489-5

Davies, S., Haines, H., Norris, B., & Wilson, J. R. (1998). Safety pictograms: are they getting the message across? *Applied Ergonomics*, 29(1), 15–23. doi:10.1016/s0003-6870(97)00021-5

Davis, T. C., Wolf, M. S., Bass III, P. F., Middlebrooks, M., Kennen, E., Baker, D. W.,Parker, R. M. (2006). Low Literacy impairs comprehension of prescription drug warnng labels. *Journal of General Internal Medicine*, *21*(8), 847-851. doi:10.1111/j.1525-1497.2006.00529.x

Deppa, S.W. (2006). US and international standards for safety symbols. In M.S. Wogalter (Ed.), *In Handbook of Warnings* (477-486). Mahwah, NJ: Lawrence Erlbaum Associates.

deTurck, M. A. (2002). Persuasive effects of product warning labels. *The persuasion handbook: Developments in theory and practice* (345-367). Thousand Oaks, California: Sage Publications.

Dewar, R. (1999). Design and evaluation of public information symbols in visual information for everyday use. In Zwaga, H.J.G, Boresema, T., & Hoonhout, C.M.(Eds.), *Design and Research Perspectives* (285-304). London: Taylor & Francis.

Dhami, M. K., & Mandel, D. R. (2012). Crime as risk taking. Psychology, *Crime & Law*, 18(4), 389–403. doi:10.1080/1068316x.2010.498423

*dictionary*. (2017, 1 16). Retrieved from Mirriam Webster: https://www.merriam-webster.com/dictionary/stop

Dingus, T. A., Wreggit, S. S., & Hathaway, J. A. (1993). Warning variables affecting personal protective equipment use. *Safety Science*, 16(5-6), 655–673. doi:10.1016/0925-7535(93)90029-d

Dowse, R., & Ehlers, M. S. (2001). The evaluation of pharmaceutical pictograms in a low-literate South African population. *Patient Education and Counseling*, 45(2), 87–99. doi:10.1016/s0738-3991(00)00197-x

Dreze, X., & Hussher, F.X. (2003). Internet advertising: Is anybody watching? *Journal of Interactive Marketiing*, *17*(4), 8-23. Retrieved from http://dx.doi.org/10.1002/dir.10063

Duarte, M. E. C. & Rebelo, F. (2005). Comprehension of safety signs: Internal and external variable influences and comprehension difficulties by disabled people. In *Proceedings of 4$^{th}$ Annual International Cyberspace Conference on Ergonomics (online). Johannesburg, Zuid-Afrika: Cyberg Online Conference.*

Duarte, E., Rebelo, F., Teles, J., & Wogalter, M.S. (2014). Safety sign comprehension by students, adult workers and disabled persons with cerebral palsy. *Safety Science*, *62*, 175-186. doi: http://dx.doi.org/10.1016/j.ssci.2013.08.007.

Duffy, S. A., & Burton, D. (2000). Cartoon characters as tobacco warning labels. *Archives of Pediatrics & Adolescent Medicine*, *154*(12), 1230-1236. doi:10.1001/archpedi.154.12.1230

Easterby, R. S., & Hakiel, S. R. (1981). Field testing of consumer safety signs: The comprehension of pictorially presented messages. *Applied Ergonomics, 12*, 143–152. doi:10.1016/0003-6870(81)90003-x

Edel, M. (1988) The Tinkertoy graphical programming environment. IEEE Trans. *Software Engineering*, 8, 1110-1115. doi:10.1109/32.7621

Edworthy, J & Adams, A. (1996). *Warning Design: A Research Prospective*. Bristol, Pennsylvania: Taylor & Francis.

Edworthy, J., & Dale, S. (2000). Extending knowledge of the effects of social influence on warning compliance. *Proceedings of the International Ergonomic Society*, *4*, 107–110. doi:10.1177/154193120004402502

Edworthy, J., Hellier, E., Morley, N., Grey, C., Aldrich, K., & Lee, A. (2004). Linguistic and location effects in compliance with pesticide warning labels for amatuer and professional users. *The Journal of the Human Factors and Ergonomics Society*, *46*(1), 11-31. doi: 10.1518/hfes.46.1.11.303.

Fabre-Thorpe, M. (2011, October). The characeristics and limits of rapid visual categorization. *Frontiers in Psychology Perception science, 2*(234), 1-12. doi:10.3389/fpsych.2011.00243

FBI Internet Piracy, n.d. https://www.fbi.gov/investigate/white-collar-crime/piracy-ip-theft/fbi-anti-piracy-warning-seal

Field, A. P., & Miles, J. (2010). *Discovering statistics using SAS:(and sex and drugs and rock'n'roll)*. Sage.

Fitzpatrick, A. (2012). $220K Music piracy case could be headed to the Supreme Court. Retrieved September 20, 2013, from http://mashable.com/2012/12/11/music-piracy-supreme-court/.

Fitzpatrick, A. (2013). Intellectual property commission: Pass CISPA now. Retrieved September 12, 2013, from http://www.mashable.com/2013/05/22/ip-commission-cispa.

Flesch, R. (1948). A new readability yardstick. *Journal of applied psychology*, *32*(3), 221. doi:10.1037/h0057532

Floyd, K., Whelan, J.P. & Meyers, A.W. (2006). Use of warning messages to modify gambling beliefs and behavior in a laboratory investigation. *Psychology of Addictive Behaviors, 20* (1), 69-74. doi:10.1037/0893-164x.20.1.69

Forsythe, A., Mulhern, G., & Sawey, M. (2008). Confounds of pictorial sets: role of complexity and familiarty in basic level processing. *Behavior Research Methods, 40*(1), 116-129. doi:10.3758/BRM.40.1.116

Frantz, J. P. (1994). Effect of location and procedural explicitness on user processing of and compliance with product warnings. *Human Factors*, *36*, 532–546. doi: 10.1177/001872089403600309

Frantz, J.P., Rhoades, T.P., Young, S.L., & Schiller, J.A., (2000). Assessing the effects of adding messages to warning labels. *Proceedings of Human Factors and Ergonomics Society 41st Annual Meeting* (pp.818-821). Santa Monica, CA: Human Factors and Ergonomics Society.

Freeman, K., & Wogalter, M. S. (2001, October). Evaluation of pictorial symbols to warn computer keyboard users about carpal tunnel syndrome (CTS). In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 45, No. 20, pp. 1468-1472). SAGE Publications.

Freestone, O., & Mitchell, V.W. (2004). Generation Y attitudes towards E-ethics and Internet – related misbehaviours. *Journal of Business Ethics*, *54*, 121-128. doi:10.1007/s10551-004-1571-0

Garcia, M., Badre, A.N., Stasko, J.T. (1994). Development and validation of icons varying in their abstractness. Interacting with computers, 6 (2), 191-211. doi:10.1016/0953-5438(94)90024-8

Garon, J.M. (2003). Normative Copyright: A conceptual framework for copyright philosophy and ethics. *Cornell Literature Review*, *88*, 1278 – 1360. doi:10.2139/ssrn.1683509

Gaver, W., (1986). Auditory icons: using sound in computer interface. *Human–Computer Interaction*, 2 (2), 167–177. doi: 10.1207/s15327051hci0202_3Giesler, M. (2006). Consumer gift systems. *Journal of Consumer Research*, *33*(2), 283-290.

Giesler, M., & Pohlmann, M. (2003). The anthropology of file sharing: Consuming Napster as a gift. *Advances in Consumer Research*, *30*(1), 273-279. doi:10.1086/506309

Gittins, D (1986). Icon Based human-computer interaction. *International Journal of Man-Machine studies*, 24, 519-543. doi:10.1016/S0020-7373(86)80007-4

Glass, R. S., & Wood, W. A. (1996). Situational determinants of software piracy: An equity theory perspective. *Journal of Business Ethics*, *15*(11), 1189–1198. doi:10.1007/bf00412817

Glinert, E. P., & Tanimoto, S. L. (1984). Pict: An interactive graphical programming environment. *Computer*, *17*(11), 7-25. doi: 10.1109/MC.1984.1658997

Godfrey, S.S., & Laughery, K.R. (1984). The biasing effects of product familiarity on consumers' awareness of hazard. *Proceedings of Human Factors Society 28th Annual Meeting* (pp.483–486). Santa Monica, CA: Human Factors Society.

Goldhaber, G. M., & deTurck, M. A. (1988). Effectiveness of warning signs: "Familiarity effects." *Forensic Reports, 1*, 281–301. http://psycnet.apa.org/psycinfo/1990-22211-001

Gopal, R.D., Sanders, G.L., Bhattacharjee, S., Agrawa, M., & Wagner, S.C. (2004). A behavior model of digital piracy. *Journal of Organizational Computing and Electronic Commerce, 14*(2), 89-105. doi: 10.1207/s15327744joce1402_01

Gottfredson, M., & Hirschi, T. (1990). *A General Theory of Crime*. Stanford, CA: Stanford University Press.

Grasa, G., Navarro, V., Rubio, O., Pena, J. A., & Santamaria, J. (2002). A comparative study of risk perception in small and large communities where chemical industries are present. *Journal of loss prevention in the process industries*, 525-530.

Haas, E. C., & van Erp, J. B. (2014). Multimodal warnings to enhance risk communication and safety. *Safety Science, 61*, 29-35. Retrieved from http://cs.doi.org/10.1016/j.ssci.2013.07.011

Hamilton, M., & Geraci, L. (2006). The picture superiority effect in conceptual implicit memory: A conceptual distinctiveness hypothesis. *The American Journal of Psychology*, 1-20.

Hammond, D. (2011). Health warning messages on tobacco products: A review. *Tobacco Control*, 20, 327 – 337. doi:10.1136/ tc.2010.037630

Hammond, D., Fong, G.T., McNeill, A., Borland, R., & Cummings, K.M. (2006). Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tobacco Control*, *15*(3), 19-25. doi: 10.1136/tc.2005.012294.

Hammond, D., Reid, J. L., Driezen, P., & Boudreau, C. (2012). Pictorial health warnings on cigarette packs in the United States: an experimental evaluation of the proposed FDA warnings. *Nicotine & tobacco research*, *15*(1), 93-102. doi:10.1093/ntr/nts094

Hancock, H.E., Fisk, A.D., & Rogers, W.A. (2005). Comprehending product warning information: Age related effects and roles of memory, inferencing, and knowledge. *Human Factors*, *47*, 219-236. doi: 10.1518/0018720054679407.

Hancock, H.E., Rogers, W.A., Schroeder, D., & Fisk, A.D. (2004). Safety symbol comprehension: Effects of symbol type, familiarity, and age. *Human Factors*, *46*, 183, doi: 10.1518/hfes.36.2.183.37344

Hardee, J.B., Mayhorn, C.B., & West, R. (2006). I downloaded what? An examination of computer security decisions. *Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting*, (pp.1817-1820). Santa Monica, CA: Human Factors and Ergonomics Society.

Hayes, C. M., & Kesan, J. P. (2012). At war over CISPA: Towards a reasonable balance between privacy and security. *Illinois Public Law Research Paper*, (13-03). Retrieved January15, 2012 from http://papers.ssrn.com/pape.tar?abstract_id=2135618

Heaps, C. M., & Henley, T. B. (1999). Language matters: Wording considerations in hazard perception and warning comprehension. *The Journal of Psychology*, *133*(3), 341-351. Retrieved April 20, 2012, from http://ezproxy.library.unlv.edu/login?url=http://search.proquest.com/docview/213834447?accountid=3611

Hellier, E., Wright, D.B., Edworthy, J., & Newstead, S. (2000). On the stability of the arousal strength of warning signal words. *Applied Cognitive Psychology*, *14*, 577-592. doi: 10.1002/1099-0720(200011/12)14:6<577

Hinduja, S. (2012). General strain, self control, and music piracy. *International Journal of Cyber Criminology*, *6*(1), 951-967. ISSN: 0974 – 2891

Hockley, W. E. (2008). The picture superiority effect in associative recognition. *Memory & Cognition*, *36*(7), 1351-1359. DOI: 10.3758/MC.36.7.1351

Hoeger, R. (1997). Speed of processing and stimulus complexity in low-frequency and high-frequency channels. *Perception*, *26*(8), 1039-1045.

Hong, W.H. (2007). The recent growth of the Internet and changes in household-level demand for entertainment. *Information Economics Policy*, *19*(3-4), 304-318. doi:10.1016/j.infoecopol.2007.06.004

Hoonhout, H.C.M. (2000). Evaluating graphical messages for mentally retarded adults: Do pictures get the intended information across? *Proceedings of the Human Factors and Ergonomics Society 44th Annual Meeting* (pp. 2798-2801). Santa Monica, CA: Human Factors and Ergonomics Society.

Horst, D. P., McCarthy, G. E., Robinson, J. N., McCarthy, R. L., & Krumm-Scott, S. (1986). Safety information presentation: Factors influencing the potential for changing behavior. *In Proceedings of the Human Factors and Ergonomics Society 30th Annual Meeting* (pp. 111–115). Santa Monica, CA: Human Factors and Ergonomics Society.

Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in imporibing health communication: A review of research on attnetion, comprehension, recall and adherence. *Patient Education and Counesling*, 173-190. doi:10.1016/j.pec.2005.05.004

Huang, C. Y. (2003). File sharing as a form of music consumption. *International Journal of Electronic Commerce*, *9*(4), 37-55. doi: 10.1080/10864415.2003.11044343

Huang, S. M., Shieh, K. K., & Chi, C. F. (2002). Factors affecting the design of computer icons. *International Journal of Industrial Ergonomics, 29*(4), 211-218

Hunt, S. D., & Vitell, S. J. (1986). A general theory of marketing ethics. *Journal of Macro Marketing*, *6*, 5–16. doi: 10.1177/027614678600600103

IFPI Digital Digital Music Report (2009). *International Federation of Phonographic Industry*. Retrieved July 23, 2012, from http://www.ifpi.org/.

*IFPI World's Largest Music Streaming Site Faces International Legal Actions*. (2016, September 26). Retrieved from RIAA.com: www.ria.com/ifpi-worlds-largest-music-streaming-site-faces-international-legal-action

Ingram, Jason R., and Sameer Hinduja. "Neutralizing music piracy: An empirical examination." *Deviant Behavior* 29, 4 (2008): 334-366.

International Organization of Standards (1997). Procedures for the development and testing of public information symbols. ISO 9186. Geneva.

Isherwood S.J., McDougall S.J., & Curry M.B. (2007). Icon identification in context: The changing role of icon characteristics with user experience. *Human Factors*, *49*(3), 465-76. doi: 10.1518/001872007X200102

Jambon, M.M., & Smetana, J.G. (2012). College students' moral evaluations of illegal music downloading. *Journal of Applied Developmental Psychology, 33*(1), 31-39. Retrieved December 12, 2012, from rhttp://dx.doi.org/10.1016/j.appdev.2011.09.001.

Johnson, C.J., Paivio, A., & Clark, J.M. (1996). Cognitive components of picture naming. *Psychological Bulletin, 120*, 113-139. http://dx.doi.org/10.1037/0033-2909.120.1.113

Joubert, O. R., Fize, D., Rousselet, G. A., & Fabre-Thorpe, M. (2008). Early interference of context congruence on object processing in rapid visual categorization of natural scenes. *Journal of Vision*, *8*(13), 11-11.

Jung, C. (1971). *Psychological Types, Collected Works (Vol. 6)*. Princeton, NJ: Princeton University Press.

Kacmar, C.J. & Carey, J.M. (2007). Assessing the usability of icons in user interfaces. *Behavior and information technology,* 10 (6), 443-457. doi: 10.1080/01449299108924303

Kalsher, M.J., Pucci, S., Wogalter, M.S., & Racicot, B.M. (1994). Enhancing the perceived readability of pharmaceutical container labels and warnings: The use of alternative designs and pictorials. *Proceedings of the Human Factors and Ergonomics Society 38th Annual Meeting* (pp. 384-388). Santa Monica, CA: Human Factors and Ergonomics Society.

Karnowski, S. (2013). Jammie Thomas-Rasset loses Supreme Court appeal, must pay $220,000 for illegal downloads. Retrieved August 2, 2013, from http://www.huffingtonpost.com/2013/03/18/jammie-thomas-rasset-supreme-court-illegal-downloading_n_2902093.html.

Kinnally, W., Lacayo, A., McClung, S., & Sapolsky, B. (2008). Getting up on the download: College students' motivations for acquiring music via the web. *New Media Society*, *10*, 893. doi:10.1177/1461444808096250.

Knopper, S. (2007, April 19). RIAA campaign rejected by colleges, *Rolling Stone*, p. 12.

Knopper, S. (2011, December 22). Digital Music's Cloud Revolution, *Rolling Stone*, p.16.

Koivisto, M., & Revonsuo, A. (2007). How meaning shapes seeing. *Psychological Science, 18*(10), 845-849.

Korpi, J., & Ahonen-Rainio, P. (2015). Design Guidelines for Pictographic Symbols: Evidence from Symbols Designed by Students. Published in "Proceedings of the 1st ICA European Symposium on Cartography", edited by Georg Gartner and Haosheng Huang, EuroCarto 2015, 10-12 November 2015, Vienna, Austria

Kools, M., van de Wiel, M.W., Ruiter, R.A., & Kok, G. (2006). Pictures and text in instructions for medical devices: effects on recall and actual performance. *Patient Education and Counseling*, 64(1), 104-111. http://dx.doi.org/10.1016/j.pec.2005.12.003

Kurniawan, S.H. "A rule of thumb of icons' visual distinctiveness" in *Proceedings on the 2000 Conference on Universal Usability*, New York: ACM Press, 2000, pp.159-160.

Kwong, T.C.H. & Lee, M.K.O. (2002). Behavioral intention model for the exchange mode Internet music piracy. *Proceedings of the 35th Hawaii International Conference on System Sciences* (pp. 2481-2490). New York, NY: IEEE.

Kwong, K.K., Yau, H.M.O., Lee, S.Y.J., Sin, L.Y.M., & Tse, A.C.B. (2003). The effects of attitudinal demographic factors on intention to buy pirated CDs: The case of Chinese consumers. *Journal of Business Ethics, 47*, 223-235. http://link.springer.com/article/10.1023/A:1026269003472

Lanska, M., Olds, J. M., & Westerman, D. L. (2014). Fluency effects in recognition memory: are perceptual fluency and conceptual fluency interchangeable? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(1), 1-11. doi:10.1037/a0034309

LaRose, R., & Kim, J. (2007). Share, Steal, or Buy? A social cognitive perspective of music downloading. *Cyberpsychology & Behavior*, *10*(2), 267-277. doi: 10.1089/cpb.2006.9959.

LaRose, R., Lai, Y.J., Lange, R., Love, B., & Wu, Y. (2006). Sharing or piracy? An exploration of downloading behavior. *Journal of Computer-Mediated Communication*, *11*, 1–21. doi: 10.1111/j.1083-6101.2006.tb00301.x

LaRose, R., & Rifon, N.J. (2007). Promoting i-Safety: Effects of privacy warnings and privacy seals on risk assessment and online privacy behavior. *Journal of Consumer Affairs*, *41*(1), 127–140. doi: 10.1111/j.1745-6606.2006.00071.x

Laughery, K.R. (2006). Safety communications: Warnings. *Applied Ergonomics*, *37*, 467-478. doi:10.1016/j.apergo.2006.04.020.

Laughery, K.R., Smith, D.P. (2006). Explicit information in warnings. In Wogalter, M.S. (Ed.), Handbook of Warnings. Lawrence Erlbaum Associates, Mahwah, NJ.

Laughery, K.R., Vaubel, K.P., Young, S.L., Brelsford, Jr., J.W., & Rowe, A.L. (1993). Explicitness of consequence information in warnings. *Safety Science*, *16*, 597-613. doi:10.1016/0925-7535(93)90025-9

Laughery, K.R., & Wogalter, M.S. (2006). Designing effective warnings. *Reviews of Human Factors and Ergonomics*, *2*(1), 241-273. doi: 10.1177/1557234X0600200109.

Laughery, K. R., & Wogalter, M. S. (2011). A three-stage model summarizes product warning and environmental sign research. *Safety Science*, *61*, 3-10. http://dx.doi.org/10.1016/j.ssci.2011.02.012

Laughery, K. R., & Young, S. L. (1991). An eye scan analysis of accessing product warning information. *In Proceedings of* the *Human Factors and Ergonomics Society 35th Annual Meeting* (pp. 585-589). Santa Monica, CA: Human Factors and Ergonomics Society.

Lavie, N. (2007). Attention and Conscioiusness. In M. Velmans, & S. Schneider (Eds.), *The Blackwell Companion of Consciousness* (pp. 489-503). Carlton, Victoria, Australia: Blackwell Publishing.

Lee, J., & Lee, Y. (2002). A holistic model of computer abuse within organizations. *Information Management & Computer Security, 10*(2–3), 57. http://dx.doi.org/10.1108/09685220210424104

Lehto, M. R., & Miller, J. M. (1986). *Warnings, volume 1: Fundamentals, design and evaluation methodologies.* Ann Arbor, MI: Fuller Technical.

Lehto, M., & Salvendy, G. (1995). Warnings: A supplement not a substitute for other approaches to safety. *Ergonomics*, *38*(11), 2155-2163. doi: 10.1080/00140139508925259.

Lemley, M.A. & Reese, R.A. (2004). Reducing digital copyright infringement without restricting innovation. *Stanford Law Review, 56*, 1345–1434. http://www.jstor.org/stable/40040194

Lenorovitz, D. R., Karnes, E. W., & Leonard, S. D. (2012). Mitigating product hazards via user warnings alone: When/why "warnings-only" approaches are likely to fail. *Human Factors and Ergonomics in Manufacturing & Service Industries*, (*00*), 1-23. doi: 10.1002/hfm.20379

Leonard, S.D. (1994). How well are warning symbols recognized? *In Proceedings of* the *12th Triennual Congress of the International Ergonomics Association* (pp. 349-350). Mississauga, Ontario, Canada: Human Factors Association of Canada

Leonard, S. D., Creel, E., & Karnes, E. W. (1991). Adequacy of responses to warning terms. *In Proceedings of* the *Human Factors Society 35th Annual Meeting* (pp. 1024–1028). Santa Monica, CA: Human Factors and Ergonomics Society

Leonard, S.D. & Karnes, E.W. (1999). Socio-environmental effects on warnings. *International Journal of Industrial Ergonomics, 25,* 11-18. doi:10.1016/S0169-8141(98)00072-9

Leonard, S.D., & Karnes, E.W. (2005). Why some warnings don't work. In *Proceedings of the 19th International Ergonomics and Safety Conference* (pp.15–19), Las Vegas, NV.

Lessig, L. (2002). Privacy as property. *Social Research*, 69(1), 247-269. http://www.jstor.org/stable/40971547

Levin, A. M., Dato-on, M. C., & Manolis, C. (2007). Deterring illegal downloading: The effects of threat appeals, past behavior, subjective norms, and attributions of harm. *Journal of Consumer Behaviour*, 6(2-3), 111-122. doi: 10.1002/cb.211

Levin, A.M., Dato-on, M.C., & Rhee, K. (2004). Money for nothing and hits for free: The ethics of downloading music from peer to peer web sites. *Journal of Marketing Theory and Practice*, *12*(1), 48–60. http://www.jstor.org/stable/40470124

Lidwell, W., Holden, K. & Butler, J., (2003). *Universal Principles of Design.* Massachusetts: Rockport Publishers.

Lim, R.W., & Wogalter, M.S. (2004). Printed warning statements and signal words on intended carefulness. *Proceedings of the Human Factors and Ergonomics Society 48th Annual Meeting* (pp. 2031-2034). Santa Monica, CA: Human Factors and Ergonomics Society.

Lindgaard, G., Chessari, J. and Ihsen, E. (1987). *Icons in telecommunication: what makes pictorial information comprehensible to the users?* Melbourne: Telecommunication Society of Australia

Lodding, K.N. (1983). Iconic interfacing. *IEEE Computer Graphics and Applications* 3 (2), 11–20. http://doi.ieeecomputersociety.org/10.1109/MCG.1983.262982

Loring, B. A., & Wiklund, M. E. (1988). Improving swimming pool warning signs. *In Proceedings of the Human Factors Society 32nd Annual Meeting* (pp. 910–914). Santa Monica, CA: Human Factors and Ergonomics Society.

Lyonski, S., & Durvasul, S. (2008). Digital piracy of MP3s: Consumer and ethical predispositions. *Journal of Consumer Marketing*, *25*(3), 167-178. doi.org/10.1108/07363760810870662.

Ma, Q., Jin, J., & Wang, L. (2010). The neural process of hazard perception and evaluation for warning signal words: Evidence form event-related potentials. *Neuroscience Letters, 483,* 206-210

Macé, M. J. M., Joubert, O. R., Nespoulous, J. L., & Fabre-Thorpe, M. (2009). The time-course of visual categorizations: you spot the animal faster than the bird. *PloS one*, *4*(6), e5927. http://dx.doi.org/10.1371/journal.pone.0005927

Magurno, A., Wogalter, M. S., Kohake, J. & Wolff, J. S. (1994). Iterative test and development of pharmaceutical pictorials. *In Proceedings of the 12th Triennial Congress of the International Ergonomics Association* (pp. 360–362). Canada, Toronto: Human Factors Association.

Main, B. W., Frantz, J. P., & Rhoades, T. P. (1993). Do consumers understand the difference between "flammable" and "combustible"? *Ergonomics in Design: The Quarterly of Human Factors Applications*, *1*(3), 14-32. doi: 10.1177/106480469300100307

Malin J., & Flowers, B.J. (2009). Adolescent self-control and music and movie piracy. *Computers in Human Behavior*, *25*, 718-722. doi: 10.1016/j.chb.2008.12.029.

Mason, R. O. (1986). Four ethical issues of the information age. *MIS Quarterly, 10*(1), 5–12. doi: 10.2307/248873

McCafferty, M. (1999). Perceived readability, understandability, and hazardousness of prescription drug warning labels as a function of icon, font size, and color. (Unpublished master's thesis). University of Nevada, Las Vegas, Las Vegas, Nevada, USA.

McCorkle, D., Reardon, J., Dalenberg, D., Pryor, A., & Wicks, J. (2012). Purchase or Pirate: A Modle of Consumer Intellectual Property Theft. *Journal of Marketing Theory and Practice, 20*(1), 73-86. Retrieved from http;//dx.doi.org/10.2753/MTP1069-6679200105

McLaughlin, A. C., & Mayhorn, C. B. (2014). Designing effective risk communications for older adults. *Safety Science, 61*, 59-65. Retrieved from http://dx.doi.org/10.1016/j.ssci.2012.05.002

McDougald, B. R., & Wogalter, M. S. (2011). Increased comprehension of warning pictorials with color highlighting. In *Proceedings of the 55th Annual Human Factors and Ergonomics Society Meeting* (pp. 1769-1772). Santa Monica, CA: Human Factors and Ergonomics Society.

McDougall, S. J., Curry, M. B., & de Bruijn, O. (1999). Measuring symbol and icon characteristics: Norms for concreteness, complexity, meaningfulness, familiarity, and semantic distance for 239 symbols. *Behavior Research Methods, Instruments, & Computers, 31*(3), 487-519. doi:10.3758/BF03200730

McDougall S.J., & de Bruijin O., & Curry M.B. (2000). Exploring the effects of icon characteristics on user performance: The role of icon concreteness, complexity, and distinctiveness. *Journal of Experimental Applied Psychology, 6*(4), 291-306. http://dx.doi.org/10.1037/1076-898X.6.4.291

McDougall, S.J. & Isherwood, S. (2009). What's in a name? The role of graphics, functions, and their interrelationships in icon identification. *Behavior Research Methods*, *41*(2), 325-336. doi: 10.3758/BRM.41.2.325

McDougall, S. J, Tyrer, V., & Folkard, S. (2006). Searching for signs, symbols, and icons: Effects of time of day, visual complexity, and grouping. *Journal of Experimental Psychology: Applied*, 12, 118-128. http://dx.doi.org/10.1037/1076-898X.12.2.118

*Media Megaupload Buisness Model Piracy*. (2012, January 22). Retrieved from venturebeat.com: venturebeat.com/2012/1/22/mediafire-megalupload-business-model-piracy

Milne, G.R., Culnan, M.J. & Greene, H. (2006). A longitudinal assessment of online privacy notice readability. *Journal of Public Policy and Marketing*, *25*(2), 238-249. http://www.jstor.org/stable/30000697.

Mongelli, L. (2003, September 9). Music pirate: N.Y. girl, 12, sued for web songs theft. *New York Post (NY)* 001. Retrieved December 16, 2014, from NewsBank on-line database (Access World News)

Moore, D. A., & Healey, P. J. (2008). The trouble with overconfidence. *Psychological Review, 115*(2), 502-517. doi:10.1037/0033-295X.115.2.502

Morrell, R. W., Park, D. C., & Poon, L. W. (1990). Effects of labeling techniques on memory and comprehension of prescription information in young and old adults. *Journal of Gerontology: Psychological Sciences*, *45*, 166–172. doi: 10.1093/geronj/45.4.P166

Morton, N.A. & Koufteros, X. (2008). Intention to commit online music piracy and its antecedents: An empirical investigation. *Structural Equation Modeling: A Multidisciplinary Journal*, *15*(3), 591-512. doi: 10.1080/10705510802154331

Moschis, G.P. & Cox, C. (1989). Deviant consumer behavior. *Advances in Consumer Research, 16*, 732-737. http://acrwebsite.org/volumes/5942/volumes/v16/NA-16

Most, S. B., Scholl, B. J., Clifford, E. R., & Simons, D. J. (2005). What you see is what you set: Sustained inattentional blindness and the capture of awareness. *Psychological Review*, 217-242.

Munafo, M. R., Roberts, N., Bauld, L., & Leonards, U. (2011). Plain packaging increases visual attention to helath warnings on cigarette packs in non-smokers and weekly smoers but not daily smokers. *Addiction, 106*, 1505-1510. doi:`0/1111/j.1360-0443.2011.03430.x

Munoz, Y., Chebat, J.C., & Borges, A. (2013). Graphic gambling warnings: How they affect emotion, cognitive responses and attitude change. *Journal of Gambling Studies*, *29*(3), 507-524. doi: 10.1007/s10899-012-9319-8.

Munoz, Y., Chebat, J.C., & Suissa, J.A. (2010). Responsible gambling among VLT players: The key role of depth information processing. *Journal of Gambling Studies*, *26*(3), 593-609. doi: 10.1007/s10899-010-9182-4.

Murphy, J. J., Allen, P. G., Stephens, T. H., & Weatherhead, D. (2005). A meta-analysis of hypothetical bias in state preference valuation. *Environmental and Resource Economics*, *30*, 313-325.

Murray, L. A., Magurno, A. B., Glover, B. L., & Wogalter, M. S. (1998). Prohibitive pictorials: Evaluations of different circle-slash negation symbols. *International Journal of Industrial Ergonomics*, *22*(6), 473-482. http://dx.doi.org/10.1016/S0169-8141(97)00029-2.

Music downloading damages against BU student Joel Tenenbaum left intact by US Supreme court (2012). Retrieved June 10, 2012 from http://www.boston.com/businessupdates/2012/05/21/music-downloading-damages-against-student-joel-tenenbaum-left-intact-supreme-court/QinlYIwd2UdAKOIhaNGPvL/story.html.

Myers, M. L., Iscoe, C., Jennings, C., Lenox, W., Minsky, E., & Sacks, A. (1981). Public version: Federal Trade Commission staff report on the cigarette advertising investigation. doi: 052163

Nakamura, C., & Zeng-Treitler, Q. (2012). A taxonomy of representation strategies in iconic communication. *International journal of human-computer studies, 70*(8), 535-551. doi:10.1016/j.ijhcs.2012.02.009

Nandedkhar, A. & Midha, V. (2011). It won't happen to me: An assessment of optimism bias in music piracy. *Computers in Human Behavior, 28,* 41-48. http://dx.doi.org/10.1016/j.chb.2011.08.009

Ng, A. Y., & Chan, A. S. (2009). What Makes an Icon Effective? *AIP Conference Proceedings, 1089*(1), 104-114. doi:10.1063/1.3078113.

Odell, P. M., Korgen, K. O., Schumacher, P., & Delucchi, M. (2000). Internet use among female and male college students. *Cyberpsychology and Behavior, 3*(5), 855–862. doi: 10.1089/10949310050191836.

Oliva, A., & Torralba, A. (2007). The role of context in object recognition. *Trends in Cognitive Sciences, 11*(12), 520-527. doi:10.1016/j.tocs.2007.09.009

Oliva, A., & Schyns, P. G. (1997). Coarse blobs or fine edges? Evidence that information diagnosticity changes the perception of complex visual stimuli. *Cognitive Psychology, 34*, 72-107.

One in five downloaders has copied files from other people's iPods or MP3 players (2005). Retrieved March 23, 2012 from http://www.pewinternet.org/2005/03/23/one-in-five-downloaders-has-copied-files-from-other-peoples-ipods-or-mp3-players

OPEN Act – Online Protection and Enforcement Digital Trade Act. (2013). Retrieved March 20, 2013, from http://www.webopedia.com/TERM/O/open_act.html

Otsubo, S. M. (1988, October). A behavioral study of warning labels for consumer products: Perceived danger and use of pictographs. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 32, No. 9, pp. 536-540). SAGE Publications.

Ozcelik, E., Arsian-Ari, I., & Cagiltay, K. (2010). Why does signaling enhance multimedia learning? Evidence from eye movements. *Computers in Human Behavior, 26*, 110-117. doi:10.1016./j.chb.2009.09.001

Paivio, A. (1971). Imagery and verbal processes. London: Holt, Rinehart & Winston

Paivio, A., Rogers, T. B., & Smythe, P. C. (1968). Why are pictures easier to recall than words?. *Psychonomic Science*, *11*(4), 137-138.

Peace, A. G., Galletta, D., & Thong, J. Y. L. (2003). Software piracy in the workplace: A model and empirical test. *Journal of Management Information Systems*, *20*(1), 153-177.

Pew Internet Project (2005). Retrieved September 12, 2012, from http://www.pewinternet.org/category/publications/reports/2005

Piracy online - the law. Retrieved February 13, 2013, from http://www.riaa.com/physicalpiracy.php?content_selector=piracy_online_the_law

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Posdsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of literature and recommended remedies. *Journal of Applied Psychology, 88*(3), 879-903. doi:10.1037/0021-9010.88.5.879

Popham, J. (2011). Factors influencing music piracy. *Criminal Justice Studies*, *24*(2), 199-209. doi: 10.1080/1478601X.2011.561648


Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Posdsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of literature and recommended remedies. *Journal of Applied Psychology, 88*(3), 879-903. doi:10.1037/0021-9010.88.5.879

Posner, M. I. (1990). The attention system of the human brain. *Annual Review Neuroscience, 13,* 25-42. Retrieved from annualreviews.org

Proserpio, L., Salvemini, S., & Ghiringhelli, V. (2005). Entertainment pirates: Determinants of Piracy in the software, music, and movie industries. *International Journal of Arts Management*, *8*(1), 33-47. http://www.jstor.org/stable/41064861

Purchase, H. (1998). Defining multimedia. *IEEE multimedia.* **5** (1), 8-15.doi: 10.1109/93.664737

Rafael, R., & Waldfogel, J. (2006). Piracy on the high c's: Music downloading, sales displacement and social welfare in a sample of college students. *Journal of Law and Economics*, *49*, 29-62. doi: 10.3386/w10874

Rasmussen, J. (2002). Human factors in a dynamic information society: Where are we heading? *Ergonomics*, *43*, 869-879. doi:10.1080/001401300409071

Reber, R., & Schwarz, N. (1999). Effects of perceptual fluency on judgments of truth. *Consciousness and Cognition*, *8*(3), 338-342.

Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of perceptual fluency on affective judgments. *Psychological Science, 9*(1), 45-48.

Reddy, L., Reddy, L., & Koch, C. (2006). Face identificaiton in the near-absence of focal attention. *Visual Research, 46*, 2336-2343.

Reddy, L., Wilken, P., & Koch, C. (2004). Face-gender discrimination in possible in the near absence-of attention. *Journal of Vision, 4*, 106-117.

Redstrom, J. (2006). Towards user design? On the shift from object to user as the subject of design. *Design Studies, 27*(2), 123-139. doi:10.1016/j.destud.2005.06.001

Ribar, N., Wogalter, M.S., & Mayhorn, C.B. (2007). Perceived hazard for images depicting before and during consequences with two kinds of prohibition symbols. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, October 2007, vol. 51 (18) 1114-1118. doi: 10.1177/154193120705101813

Rifon, N. J., LaRose, R., & Choi, S. (2005). Your privacy is sealed: Effects of web privacy seals on trust and personal disclosures. *Journal of Consumer Affairs, 39*(2), 339-362. doi: 10.1111/j.1745-6606.2005.00018.x

Ringseis, E. L., & Caird, J. K. (1995). The comprehensibility and legibility of twenty pharmaceutical warning pictograms. *In Proceedings of* the *Human Factors and Ergonomics Society 39th Annual Meeting* (pp. 998–1002). Santa Monica, CA: Human Factors and Ergonomics Society.

Robertson, K., McNeill, L., Green, J., & Roberts, C. (2012). Illegal downloading, ethical concern, and illegal behavior. *Journal of Business Ethics*, *108*, 215-227. doi: 10.007/s10551-011-1079-3.

Roediger, H. L. (1990). Implicit Memory: Retention without remembering. *American Psychologist*, 1044-1056.

Rogers, Y. (1986) 'Evaluating the meaningfulness of icon sets to represent command operations' in Harrison, M.D. and Monk, A.F. (eds) *Human Factors in Organizational* Design and *Management* Cambridge: University Press.

Rogers, Y. (1989). Icons at the interface: their usefulness. *Interacting with Computers, 1*(1), 105-117. doi: 10.1016/0953-5438(89)90010-6

Rogers, W.A., Lamson, N., & Rousseau, G.D. (2000). Warning research: An integrative perspective. *Human Factors*, 42, 102. doi: 10.1518/001872000779656624.

Rose, R.D. (2002). Connecting the dots: Navigating the laws and licensing requirements of the Internet music revolution. *IDEA : The Journal of Law and Technology*, *42*, 313-360. http://heinonline.org/HOL/Page?handle=hein.journals/idea42&div=22&g_sent=1&collection=journals

Rosson, M. B., & Carroll, J. M. (2002). *Usability Engineering: Scenario-Based Development of Human-Computer Interaction*. San Francisco, CA: Morgan Kaufmann Publishers.

Rousseau, G. K., Lamson, N., & Rogers, W. A. (1998). Designing warnings to compensate for age-related changes in perceptual and cognitive abilities. *Psychology & Marketing, 15*(7), 643–662. doi: 10.1002

Saarikallio, S. & Erkkila, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music*, *35*(1), 88-109. doi: 10.117/0305735607068889.

Sag, M. (2006). Twelve year-olds, grandmothers, and other good targets for the recording industry's file sharing litigation. *Northwestern Journal of Technology and Intellectual Property*, *4*(2), 133-155. http://heinonline.org/HOL/Page?handle=hein.journals/nwteintp4&div=12&g_sent=1&collection=journals

Sanders, M.S., & McCormick, E.J., (1993). *Human Factors in Engineering and Design (7th edition).* New York: McGraw-Hill.

Selwyn, N. (2008). A Safe Haven for Misbehaving? An investigation of online misbehavior among university students. *Social Science Computer Review*, *26*(4), 446-465. doi: 10.1177/0894439307313515.

Shanahan, K. J., & Hyman, M. R. (2010). Motivators and enablers of SCOURing: A study of online piracy in US and UK. *Journal of Business Research, 63*, 1095-1102. doi:10.1016/j.busres.2009.02.026

Shang, R.A., Chen, Y.C., & Chen, P.C. (2008). Ethical decisions about sharing music files in the P2P environment. *Journal of Business Ethics, 80*, 349-365. doi:10.1007/s10551-007-9424-2

Shaver, E.F., Young, S.L., Frantz, J.P., Rhoades, T.P., Hall, S.M., & Shah, R.J. (2006). Comparison of ANSI and ISO standard formats on people's response to product warnings. *Proceedings of* the *Human Factors and Ergonomics Society 50th Annual Meeting* (pp. 2197-3002). Santa Monica, CA: Human Factors and Ergonomics Society.

Shieh, K.K., & Huang, S.M. (2003). Factors affecting preference ratings of prohibitive symbols. *Applied Ergonomics*, 34, 581-587. doi:10.1016/S0003-6870(03)00078-4

Silver, N. C., Basin, M. G., Sexton, C. A., & Fabbi, J. L. (1998, October). Comprehensibility of pharmaceutical pictorials among people with mental retardation. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 42, No. 9, pp. 656-660). SAGE Publications

Silver, N.C., Drake, K.L., Niaghi, Z.B., Brim, A.C., & Pedraza, O. (2002, September). In Proceedings of the Human Factors and Ergonomics Society 26th Annual Meeting (pp. 735-746). Santa Monica, CA: Human Factors and Ergonomics Society.

Silver, N.C., Leonard, D.C., Ponsi, K.A., & Wogalter, M.S., (1991). Warnings and purchase intentions for pest-control products. *Forensic Reports, 4*, 17–33. http://psycnet.apa.org/psycinfo/1991-23068-001

Silver, N. C., Tubilleja, K., & Ferrante, R. (1995). Signal words: Perceived carefulness by the developmentally disabled. *In Proceedings of the Human Factors and Ergonomics Society 39th Annual Meeting* (pp. 440-444). Santa Monica, CA: Human Factors and Ergonomics Society.

Silver, N. C. & Wogalter, M. S. (1989). Broadening the range of signal words. *Proceedings of the 33rd Annual Meeting of the Human Factors and Ergonomics Society* (pp. 555-559). Santa Monica, CA: Human Factors and Ergonomics Society.

Silver, N. C., Wogalter, M. S., Brewster, B. M., Glover, B. L., La Tondra, A. M., Tillotson, C. A., & Temple, T. L. (1995). Comprehension and perceived quality of warning pictorials. *In Proceedings of the Human Factors and Ergonomics Society 39th Annual Meeting* (pp. 1057-1061). Santa Monica, CA: Human Factors and Ergonomics Society.

Sinha, R.K., & Mandel, N. (2008). Preventing digital music piracy: The carrot or the stick? *Journal of Marketing*, *72*, 1-18. http://dx.doi.org/10.1509/jmkg.72.1.1

Sinha, R.K, Machado, F.S. & Sellman, C. (2010). Don't think twice, it's alright: Music piracy and pricing in a DRM free environment. *Journal of Marketing*, *74,* 40-54. http://dx.doi.org/10.1509/jmkg.74.2.40

Smallman, H.S., St. John, M., Oonk, H., Cowen, M.B. (2001). Symbicons: A hybrid symbology that combines the best elements of symbols and icons. *Proceedings Of The Human Factors and Ergonomics Society, 45th Annual Meeting,* 45 (2), 110-114. doi: 10.1177/154193120104500224

Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: Norms for name agreement, image agreement, familiarity and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory, 6*(2), 174-215.

Spink, J., Singh, J., & Singh, S. P. (2011). Review of package warning labels and their effect on consumer behaviour with insights to future anticounterfeit strategy of label and communication systems. *Packaging Technology and Science*, *24*(8), 469-484.

Sterling, J. A. L. (2003). *World Copyright Law: Protection of Authors' Works, Performances, Phonograms, Films, Video, Broadcasts and Published Editions In National, International* *and Regional Law: With A Glossary of Legal And Technical Terms, and a Reference List of Copyright And Related Rights Laws Throughout the World*. United Kingdom: Sweet & Maxwell.

Stenberg, G. (2006). Conceptual and perceptual factors in the picture superiority effect. *European Journal of Cognitive Psychology*, *18*(6), 813-847.

Strasser, A.A., Tang, K.Z., Romer, D., Jepson, C., & Cappella, J.N. (2012). Graphic warning labels in cigarette advertisements recall and viewing patterns. *American Journal of Preventative Medicine*, *43*(1), 41-47. http://dx.doi.org/10.1016/j.amepre.2012.02.026.

Tam, C. M., Fung, I. W., Yeung, T. C., & Tung, K. C. (2003). Relationship between construction safety signs and symbols recognition and characteristics of construction personnel. *Construction Management and Economics*, *21*(7), 745-753. doi: 10.1080/0144619032000056171

Tan, B. (2002). Understanding consumer ethical decision making with respect to purchase of pirated software. *Journal of Consumer Marketing*, *19*(2), 96-122. doi: 10.1108/07363760210420531

Terrel, G., & Douglas, K. (2001). Unchained melody: A price discrimination-based policy proposal for addressing the MP3 revolution. *Journal of Economic Issues*, *35*, 279. http://www.jstor.org/stable/4227659

Thong, J. Y. L., & Yap, C.S. (1998). Testing an ethical decision making theory: The case of soft lifting. *Journal of Management Information Systems*, *15*(1), 213–237. http://www.jstor.org/stable/40398379

Torralba, A., Castelhano, M. S., Henderson, J. M., & Oliva, A. (2007). Contextual guidance of eye movements and attention in real-world scenes: the role of global features in object search. *Psychological Review, 113*(4), 766-786. doi:10.1037/70033-295X.113.4.766

Ullman, S. (2006). Object recognition and sementation by a fragment-based hierarchy. *Trends in Cognitive Science, 11*(2), 58-63. doi:10.1016/j.tics.2006.11.009

U.S. Const. art. I, § 8.

Vukelich, M., & Whitaker, L. A. (1993, October). The effects of context on the comprehension of graphic symbols. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (Vol. 37, No. 8, pp. 511-515). SAGE Publications. doi: 10.1177/154193129303700804

Wagner, A. D., Gabrieli, J. D., & Verfaellie, M. (1997). Dissociations between familiarity processes in explicit recognition and implicit perceptual memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *23*(2), 305. doi: 10.1037/0278-7393.23.2.305

Wang, H. F., Hung, S. H., & Liao, C. C. (2007, August). A survey of icon taxonomy used in the interface design. In *Proceedings Of The 14th European Conference On Cognitive Ergonomics: Invent! Explore!*, 203-206. ACM. doi: 10.1145/1362550.1362591

Wang, X. & McClung, S.R. (2010). Toward a detailed understanding of illegal digital downloading intentions: An extended theory of planned behavior approach. *New Media & Society*, *13*(4), 663-677. doi: 101177/1461444810378225.

Webb, J. M., Sorenson, P. F. and Lyons, N. P. (1989). An empirical approach to the evaluation of icons. *SIGCHI Bulletin.* 21 (1). 87-90. doi: 10.1145/67880.67894

Westerman, D. L. (2008). Relative fluency and illusions of recognition memory. *Psychonomic Bulletin & Review, 15*(6), 1196-1200.

William, P., Nicholas, D. & Rowlands, I. (2010). The attitudes and behaviors of illegal downloaders. *Aslib Proceedings: New Information Perspectives*, *63*(3), 283-301. doi: 10.1108/00012531011046916.

Williams, D. J., & Noyes, J. M. (2007). How does our perception of risk influence decision-making? Implications for the design of risk information. *Theoretical issues in ergonomics science*, *8*(1), 1-35. http://dx.doi.org/10.1080/14639220500484419

Wingrove, T., Korpas, A.L., & Weisz, V. (2011). Why were millions of people not obeying the law? Motivational Influences on non compliance with the law in the case of music piracy. *Psychology, Crime, and Law*, *17*(3), 261-276. doi: 10.1080/10683160903179526.

Whittlesea, B. W. (1993). Illusions of Familiarity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*(6), 1235-1253.

Wogalter, M. S. (2006). Communication-human information processing (C-HIP) model. In M. S. Wogalter (Ed.). *Handbook of Warnings* (pp. 51-61). Mahwah, NJ: Lawrence Erlbaum Associates.

Wogalter, M. S., Barlow, T., & Murphy, S. A. (1995). Compliance to owner's manual warnings: influence of familiarity and the placement of a supplemental directive. *Ergonomics*, *38*(6), 1081-1091. doi: 10.1080/00140139508925175

Wogalter, M.S., Jarrard, S.W., & Simpson, S.N. (1992). Effects of warning signal words on consumer product hazard perceptions. *Proceedings of the Human Factors and Ergonomics Society 36th Annual Meeting* (pp. 935-939). Santa Monica, CA: Human Factors and Ergonomics Society. doi: 10.1177/154193129203601303.

Wogalter, M. S., Jarrard, S. W., & Simpson, S. N. (1994). Influence of warning label signal words on perceived hazard level. *Human Factors*, *36*(3), 547-556. doi: 10.1177/001872089403600310

Wogalter, M. S., & Laughery, K. R. (1996). Warning! Sign and label effectiveness. *Current Directions in Psychological Science*, *5*(2), 33-37. http://www.jstor.org/stable/20182386

Wogalter, M.S., & Mayhorn, C.B. (2005). Providing cognitive support with technology-based warning systems. *Ergonomics*, *48*(5), 522-533. doi:10.1080/00140130400029258

Wogalter, M.S., Murray, L.A., Glover, B.L., & Shaver, E.F. (2002). Comprehension of different types of prohibitive safety symbols with glance exposure. *Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting*. 1753-1757. doi: 10.1177/154193120204601914

Wogalter, M. S., Shaver, E. F., & Kalsher, M. J. (2014). Effect of presentation modality in direct-to-consumer (DTC) prescription drug television advertisements. *Applied ergonomics*, *45*(5), 1330-1336.

Wogalter, M. S., & Silver, N. C. (1990). Arousal strength of signal words. *Forensic Reports*, 3, 407-420.

Wogalter, M. S., & Silver, N. C. (1995). Warning signal words: Connoted strength and understandability by children, elders, and non-native English speakers. *Ergonomics*, *38*(11), 2188-2206. doi: 10.1080/00140139508925262

Wogalter, M. S., Silver, N. C., Leonard, S. D. & Zaikina-Montgomery, H. (2006). Warning symbols. In M. S. Wogalter (Ed.). *Handbook of Warnings* (pp. 160-176). Mahwah, NJ: Lawrence Erlbaum Associates.

Wogalter, S., Sojourner, R.J., & Brelsford, J.W. (2010). Comprehension and retention of safety pictorials. *Ergonomics*, *40*(5), 531-542. http://dx.doi.org/10.1080/001401397188017.

Wolff, J. S., & Wogalter, M. S. (1998). Comprehension of pictorial symbols: Effects of context and test method. *Human Factors*, 40, 173–186. doi: 10.1518/001872098779480433

Woolley, D.J. (2010). The cynical pirate: How cynicism affects music piracy. *Academy of Information and Management Sciences Journal*, *13*(1), 31-45.

Woolley, D., & Einning, M.M. (2006). Software piracy among accounting students: A longitudinal comparison of changes and sensitivity. *Journal of Information Systems*, *20* (1), 49-63. http://dx.doi.org/10.2308/jis.2006.20.1.49

Yonelinas. (2002). The Nature of Recollection and Familiarity: A Review of 30 Years of Research. *Journal of Memory and Language*, 441-517. doi:10.1006/jmla.2002.2864

Young, S. L. (1991). Increasing the noticeability of warnings: Effects of pictorial, color, signal icon and border. *Proceedings of the Human Factors and Ergonomics Society 35th Annual Meeting* (pp. 580-584). Santa Monica, CA: Human Factors and Ergonomics Society.

Young, S.L. (1998). Connotation of hazard for signal words and their associated panels. *Applied Ergonomics*, *29*(2), 101-110. http://dx.doi.org/10.1016/S0003-6870(97)00038-0.

Young, S. L. & Wogalter, M. S. (1990). Comprehension and memory of instruction manual warnings: Conspicuous print and pictorial icons. *Human Factors*, *32*, 637-649. doi: 10.1177/001872089003200603

Yu, R-F., & Chan, A.H.S. (2004). Chinese perceptions of implied hazard for signal words and surround shapes. *Human Factors and Ergonomics in Manufacturing*, *14*(1), 69-80. doi: 10.1002/hfm.10048.

Zaikina-Montgomery, H. (2011). The dilemma of minor's access to adult content on the Internet: A proposed warnings solution. (Unpublished doctoral thesis). University of Nevada, Las Vegas, Las Vegas, Nevada, USA.

Zhang, L., Smith, W.W., & McDowell, W.C. (2009). Examining digital piracy: Self control, punishment, and self efficacy. *Information Resources Management Journal*, *22*(1), 24-44. doi: 10.4018/irmj.2009010102

Zittrain, J. (2000). What the publisher can teach the patient: Intellectual property and privacy in an era of trusted privication. *Stanford Law Review*, *52*(5), 1201-1250. http://www.jstor.org/stable/1229513.

Zuckerman, A., & Chaiken, S. (1998). A heuristic-systematic processing analysis of the effectiveness of product warning labels. *Psychology & Marketing*, *15*, 621–664. doi: 10.1002

Zwaga, H. J., & Boersma, T. (1983). Evaluation of a set of graphic symbols. *Applied Ergonomics*, 14, 43–54. http://dx.doi.org/10.1016/0003-6870(83)90220-X.

Zwaga, H., & Easterby, R. (1980). Developing effective symbols for public display. In *Proceedings of a NATO Conference on Visual Presentation of Information*. Sussex: Wiley & Sons Ltd.

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**EDUCATION**

***Doctorate of Philosophy,*** Experimental Psychology, University of Las Vegas, Nevada, May 2017
***Master of Arts***, Industrial/Organizational Psychology, Farleigh Dickinson University, May 2009
***Bachelor of Science***, Molecular Biology, Montclair State University

**TEACHING EXPERIENCE**

Introduction to Psychology (PSY 101)
Fall 2012, Fall 2013
Behavioral Statistics (PSY 210)
Spring 2014, Spring 2015
Research Methods in Psychology
Fall 2014, Fall 2015, Spring 2016, Fall 2016

**PUBLICATIONS**

Silver N.C., Ullman J., Picker CJ. (2015). COMPCOR: a computer program for comparing correlations using confidence intervals. *Psychology and Cognitive Science Open Journal*, 1(1), 26-28.

Barchard, K.A., Hurlburt, R.T., Westfall, R.S., Ullman, J., & Day, T. (2012). *Item bank for comprehending Behavioral Statistics* ($5^{th}$ edition) by Russell Hurlburt. Contains 1586 items for 20 quizzes. Available as part of *Personal Trainer 5.0* Russell Hurlburt

**POSTERS PRESENTED AT PROFESSIONAL MEETINGS**

Ullman, J. & Silver, N.C. (2013, April). *Sex and Ethnicity Differences in Money Attitudes*. Poster presented at Ninety-Third Annual Western Psychological Association Conference, Reno, NV.

Ullman, J & Silver, N.C. (2013, April). *Predicting Compulsive Buying from Money Ethics and Self Efficacy*. Poster presented at the Ninety-Third Annual Western Psychological Association Conference, Reno, NV.

Ullman, J. & Silver, N.C. (2013, April). *Sex and Ethnicity Differences in Investment Literacy and Risk*. Poster presented at the Rocky Mountain Psychological Conference, Denver, CO

Ullman, J. & Silver, N.C. (2014, March). *Ethnicity Differences in Financial Behavior*. Poster presented at Southeastern Psychological Association, Nashville, Tennessee.

Ullman, J. & Silver, N.C. (2014, April). *Predicting Self Efficacy from Financial Knowledge*. Poster presented at the Western Psychological Association Conference, Portland, Oregon.

Ullman, J. & Silver, N.C. (2015, April). *The Prediction of Personality Traits by Money Attitudes.* Poster presented at the South Eastern Psychological Association Conference, Hilton Head, South Carolina.

**MEMBERSHIPS**

Psi Chi, National Honor Society for Psychology
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