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The Dilemma of minors' access to adult content on the Internet: A proposed warnings solution

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THE DILEMMA OF MINORS' ACCESS TO ADULT CONTENT ON THE

INTERNET: A PROPOSED WARNINGS SOLUTION

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ABSTRACT

The Dilemma of Minors' Access to Adult Content on the Internet: A Proposed Warnings Solution

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The Internet can be a dangerous place for children. Because minors have unrestricted access to adult content, a system of warnings targeting minors on the Internet should be developed. The present studies tested icons for such a system and subsequently to examined selected icons in combination with signal words, color, and warning messages. One hundred and ninety three adults and eleven children participated in the first study. Participants rated thirty eight icons created by the researcher for their understandability, carefulness, attention-getting, likelihood of encountering and severity of danger, likelihood of avoidance and familiarity. Familiar icons were found to be rated higher in all, but one (avoidance) variables than unfamiliar icons, abstract icons were rated as communicating more danger than concrete icons, and prohibitive icons were rated higher than non-prohibitive icons. Three hundred and fifty three adults and ten children participated in the second study. In this study, the five most effective icons from Study I (effectiveness was the best linear combination of understandability, carefulness, attention-getting, danger, and avoidance) were paired with signal words (STOP and WARNING) in black and red and warning messages, ranging in severity and explicitness. Results indicated that the signal word STOP was rated higher overall than WARNING, the color red was rated higher than black, and ratings for warning messages increased as

the message explicitness and severity increased. A significant four-way icon x color x signal word x warning message interaction was found and interpreted. All other interactions were likewise significant; the color x signal word interaction was interpreted to fill in the gap in the interpretation of the larger interaction.

Most of the results were supported in the previous literature findings. However, it was found that for the likelihood of avoidance variable, the most severe message was less effective than the less severe messages for the Crying Baby, Prohibit, and Boy icons. Results and future research directions are discussed.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

The Internet is arguably one of the most statistically significant advents of the 20th

century in its impact and use in work, entertainment, leisure, and communication. Like

no other media before it, the Internet has offered its users the ability to broadcast,

collaborate, and share ideas without the constraints of geographic location and time.

Increasingly, the Internet has become embedded in the everyday lives of people

throughout the world.

The "Internet" is defined as an electronic network that enables the sharing and linking

of information and people through computers (DiMaggio, Hargittai, Neuman, &

Robinson, 2001). Although the inception of a primitive network serving as the basis for

the Internet can be traced back to the 1960's, this network was originally developed with

the purpose of scientific and military communication. In the mid-1960's, various

academic communities and military organizations worked on computing research projects

that explored time-sharing, artificial intelligence, and graphic interfaces. This research

gave rise to the first time-sharing network, ARPANET. In the mid-1970's, the Internet

became a tool used in military communication and did not emerge into the public realm

until the early 1980's (Abbate, 1999). Although very limited public access to the Internet

was available as early as 1982, widespread public use of the Internet did not start until the

1990's. One of the major contributing factors for this was the invention and

implementation of more advanced graphic interface programs, which allowed a less

sophisticated end-user to access the Internet. Another major contribution was the

involvement and participation of private commercial interests in the distribution of

Internet services and Internet-related products (Castells, 2001). This combination of advanced scientific elements, such as computer programming, graphic design, and the involvement of the business culture have helped shape today's Internet.

As with any new invention that encompasses a communication medium, the impact of the Internet on all socio-demographic units of the population is considerable. This impact includes many aspects of culture, including the economic, social, behavioral, and psychological. Because of the recency and the dynamic sophistication of the World Wide Web, children[1] have become avid users. Arguably, the experiences of childhood, adolescence, formation of identity, and other aspects of development have been particularly affected by the use and availability of the Internet. Hence, in the next few sections, the focus will be pointed to the impact of the Internet on the social, behavioral, and psychological components of the lives and experiences of teenagers and children. Trends of Internet use, benefits, and negative impacts of Internet use by teenagers and children will be discussed.

Children's and Teens' Use of the Internet

Internet use trends.

According to a 2003 report published by the School of Information Management and Systems at the University of California at Berkeley, 580 million people used the Internet worldwide in 2002, with the United States accounting for 30% of that number (roughly 174 million) (Lyman & Varian, 2003). Currently, the number of Internet users worldwide is 1.2 billion, 235 million of whom live in North America (Internet World Stats, 2007).

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[1] Here and throughout "children" are individuals under 18 years of age.

In 2003, Livingstone reviewed children's use of the Internet. This topic had been of little interest to social scientists, although of a considerable interest to the marketing and business community. She suggested a research agenda based on marketing surveys that should be followed by social scientists and psychologists with regard to the behavior trends of teens and children on the Internet. Her research agenda called for more involvement on the part of academics in the areas of quantitative and qualitative research on children's use of the Internet in order to gain insight into their experience. Furthermore, Livingstone (2003) argued that research on children and the Internet must probe beyond access and encompass areas such as social conditions, cultural practices, and quality of Internet use. In 2001, 75% of children ages 7 to 16 had used the Internet, with the majority of them using it for purposes of homework (73%) and a smaller percentage for e-mail and other communication (59%). These observations showed evidence of an emerging trend among the younger population to utilize the Internet for schoolwork, entertainment, and communication. These results have been substantiated in subsequent work.

A more recent study, the 2007 PEW Internet & American Life Project revealed a large amount of information about the general use and behavior of Americans on the Internet and specifically about those of teens and children. According to the PEW project, 75% of American adults used the Internet. Of these Internet users, the most common uses of the Internet ranged from sending and receiving e-mail (92%) to downloading or sharing adult content online (4%) (Lenhart & Madden, 2007). One of the more striking findings of the PEW Internet project is the in-depth examination of the trends and behaviors of teens on the Internet and their management of their online

identity. Most teens, according to the report, utilized social networking sites such as

Myspace and Facebook to connect with friends and create public social profiles. These

profiles often contain the age, geographical location, and personal information of the

user. The way that teens manage their identity and privacy online has meaningful

implications for their lives. Although online social networks are important in today's

teens' social and personal identity formations, participation in such networks can also

have detrimental consequences. By sharing their personal information online through the

creation of an online identity, teens may put themselves at risk of harming their future

college and job prospects. Moreover, they are at a higher probability for potential

victimization and predation.

    According to the PEW Internet & American Life project (2007), 93% of all

Americans between the ages of 12 and 17 used the Internet. This number has increased

across time; ranging from 73% of teenage Internet users in 2000 to 87% in 2004. Internet

use among teens today is much more frequent, with 89% of teens using the Internet at

least once a week. This percentage has increased from 42% in 2000 and 51% in 2004.

Teens are using the Internet in all aspect of their lives, ranging from education to

entertainment (Lenhart & Madden, 2007). Although the vast majority of teenagers today

are accessing the Internet on a daily basis, there are still some obvious gender, age, and

socio-economic status differences with regard to Internet use and access.

Gender and age differences in Internet use.

    Boys and girls behave differently when it comes to their Internet use and the type of

activities and behavior that they engage in while using the Internet. This difference in

behavior is also true for different age groups, such as younger and older teens. Boys are

usually more technologically savvy than girls and are more willing to share personal information with others online, although there are indications that this gap in competence is growing smaller as the Internet's availability widens (Lenhart & Madden, 2007; Madell & Muncer, 2004). Boys are also more likely to use the Internet for information and entertainment, such as playing games online. Girls are more likely to use the Internet for the purposes of social interaction with peers via online profiles; that is sharing pictures of themselves and friends and writing personal blogs. Younger teens, usually categorized between the age of 12 and 14 in the literature (Madell & Muncer, 2004), primarily use the Internet for entertainment purposes. Older teens, categorized as those between the ages of 15 and 17 (Madell & Muncer, 2004), use the Internet more frequently to socialize with peers and obtain information in order to purchase products (DiMaggio et al., 2001; Lenhart & Madden, 2007; Madell & Muncer, 2004).

There is evidence that a gender difference in online behavior began to delineate as early as 2004, when personal computers in households became more widespread due to their popularity and affordability. Madell and Muncer (2004) reported a statistically significant difference between male and female internet users, with 85% of males stating that they used the Internet as compared to 80% of females. A statistically significant difference was likewise found between males and females in terms of having an e-mail account (78% and 70%, respectively) and having a personal web page (22% and 10%, respectively). Boys differed statistically significantly from girls in the reasons and purposes for which they use the Internet. Boys were more likely to use the Internet for playing or downloading music and video games, finding out information about products and services, and buying products. Girls were more likely to use the Internet for social

and interaction purposes, such as e-mail, chat rooms, and schoolwork (Madell & Muncer, 2004).

The general trend of female teens using the Internet for social networking has continued from 2004 to the present. According to the 2007 PEW Internet & American Life Project, females were more likely than males to have profiles on social network websites such as MySpace and Facebook (58% and 51%, respectively). Seventy percent of girls aged 15-17 reported having an online profile; the proportion for boys in that age range was 57%. However, younger teens and boys were more likely than older girls to post false information about themselves online.

Marked gender differences were reported in the type of information male and female teens are willing to share about themselves online. Girls were found to be more likely to share photos of themselves (83%) and of their friends (72%) as opposed to boys (74% and 58%, respectively). However, boys were more likely to engage in less safe behavior on the Internet than did girls, such as posting the town or city where they live (68% versus 54% for girls) and sharing their last name (40% versus 20% for girls). These differences in Internet behavior have wide-ranging implications in terms of the impact that Internet use has on the social, behavioral, and psychological well-being and development of children and teens. Furthermore, differences and commonalities in the perception and treatment of privacy and safety have even more serious implications for teens in terms of falling victim to many forms of Internet predation.

Since Livingstone's (2003) comprehensive review children's and teens' use of the Internet, academic researchers have begun studying the impact of the Internet on children and teens. It is important here to review the existing literature on the social, behavioral,

and psychological aspects of the lives of children and teenagers and to identify issues and concerns.

Impact of the Internet on Development

Overall, the Internet is a positive addition to the way that the world conducts commerce, education, and communication. However, there is some evidence that there are negative experiences that children and teens can encounter on the Internet. Specifically, the possible risks of Internet use include: exposure to sexual content, exposure to hate literature or Internet bullying, illegal activities on the Internet, incorrect information (i.e., information that is misleading, erroneous, or comes from unreliable sources), negative role models, meeting dangerous strangers, and harassment by others among other risks (Cartwright, Finkelstein, & Maennling, 2008). For example, many girls reported exposure to pornography either inadvertently through innocuous web searches, unsolicited emails, or chat (Nua Internet Surveys, 2002, c.f. Cartwright et al., 2008). These Internet risks affect children on psychosocial and behavioral levels which can lead to detrimental impact on their development.

Impact of the Internet on psychosocial development and identity formation.

"Psychosocial development" is a broad term, encompassing many facets of human life and maturation processes that occur across the lifespan. Of particular interest, is the segment of psychosocial development that teenagers undergo as they leave childhood behind, transition into adolescence, and stand at the doorstep of adulthood. One of the challenges of progressing into adolescence is the formation of self-definition and self-identity (Erikson, 1968). According to Erikson, at this time of transition, adolescents begin to develop a sense of identity and to establish concrete goals, opinions, attitudes,

and beliefs. Furthermore, teenagers progress through a period of questioning and exploration (identity moratorium) and transition into a phase of commitment to ideas and ideals (identity achievement). It is at identity moratorium that a teen's relationship with the Internet potentially influences their identity.

Children and adolescents growing up in today's society are the first generation to grow up with the computer and the Internet as an embedded and somewhat necessary part of their daily lives. It is necessary for most school children to use the Internet in some capacity for the purposes of homework, starting as early as middle school. With the emerging popularity of online social network websites such as MySpace and Facebook, that provide a place on the Internet where users can create personal profiles and connect that profile to the profiles of others; establishing one's social identity through presence and personal statements on the Internet has become commonplace and in some cases fundamental to teenagers' self-expression. The PEW Internet & American Life Project (2007) reported that 55% of all online American teens use social networks and 55% of online teens ages 12-17 have posted a profile online. Teenage girls, especially girls ages 15-17, are more likely to use social networking websites and to post a personal profile online than others in the teenage demographic. Teens who use social networking websites visit them more frequently than other websites to edit or update their profiles (Lenhart & Madden, 2007). Internet social networking profiles, however, are not a static confirmation of a teen's existence and presence on the Internet. Most teens use social networking websites to connect and communicate with friends via messages on their profile page or by posting a message on a friend's page. Through this communication, teens believe that they are a part of a cohort of peers who share their beliefs and ideals

and gain a sense of popularity that they may not experience or achieve in their life offline.

Turkle (1995) suggested that the Internet is a comparatively safe place for teens to experiment with issues of sexuality and politics. Although this may have been the case in the mid-1990s when the Internet was still a relatively new invention not widely available to the public, it is less clear today that this is the case. This is illustrated by the questions raised ten years later by Bremer (2005). She acknowledged the importance of strong social networks in the formation of social identity. However, she also posed the question of whether the Internet is a benefit or a detriment to teenagers' interpersonal relationships and social involvement.

The emergence of the Internet and its role in the daily lives and routines of children and teens is a complex issue with no single answer or solution. Certainly, the Internet's ability to allow a child to chat with friends or e-mail his or her grandparents in another state is a benefit that did not exist for previous generations. However, this type of beneficial use is dramatically different from the negative impact that the Internet may have on a child who is downloading violent games, music, or pornography. Bremer (2005) suggested that the extent of the Internet's positive or negative impact may depend on the particular personal traits that a child brings into the equation. For example, children who are naturally shy may obtain the positive experience of practicing social interactions with others in an anonymous setting with little consequence to the mistakes they make. These mistakes may have a more serious impact in real-life social situations. On the other hand, chatting, e-mailing, and participating in social networking websites such as Facebook and MySpace is more time consuming than real life communications

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(e.g., face-to-face or telephone). This extra time that teens spend online may take away from the important aspect of real-world friendship and relationship formation. In addition to the impact that the Internet has on the formation of social identity of teens, it also plays a role in the psychological development of children who use it.

The process of identity formation (see Bosma, Graafsma, Grotevant, & deLevita, 1994; Grotevant, 1987a; Kegan, 1982) that occurs in adolescence is likewise impacted by the use of the Internet for today's teens. Identity formation in adolescents has been studied from both social psychological and developmental perspectives and a few models of this process have been proposed to date (Grotevant, 1987b). The process of identity formation has been described as both developmental and contextual. It is developmental in terms of forming a sense of identity and contextual because through this process adolescents begin to realize the many roles that they have in society such as student, child, peer, and sibling (Grotevant, 1987a). Although the process of identity formation takes place, arguably, over the span of one's lifetime, the first step in this process is usually taken in one's teenage years. Identity formation is a multi-faceted process encompassing roughly four components. The first of these is the individual characteristics that one brings to the process. These characteristics influence the choices, decisions, and actions that one will make over their lifespan. The second component is the process within any specific area of life such as career choice, political beliefs, and family decisions. The third component of identity formation is the contextual aspect of development. This includes an individual's family, friends, peers, and school colleagues; that is, the different contexts in which various aspects of identity develop and the different ways that these will influence the process of identity development. The final

component is the interdependency and interaction among the different aspects of an individual's development (Grotevant, 1987b; Marcia, 1966). Swann (1987) proposed a fifth component, which he termed behavioral confirmation, a process through which some individuals channel social interaction for influencing the behavior of others. Through behavioral confirmation, Swann (1987) argued that individuals engage in the self-verification process. This process allows them to learn what types of outcomes to expect from their words. Thereby, individuals can observe their own behavior, the reactions of others to their behavior, and verify that their behavior results in the correct intended outcome. Snyder and Swann (1978) believed that teenagers begin a self-verification process through which they gain opportunities to confirm their view of themselves. This process often includes selective interaction with others, especially peers. Selective interaction allows teens to choose those with whom they interact in order to confirm their own self-concept, thereby gaining confirmation of the self-identity that they are developing. Swann, Pelham, and Chidester (1987) confirmed the assertion that teens have a tendency to form social connections with those who view them similarly to how they view themselves.

It can be argued that the Internet is a convenient forum through which teenagers can practice the process of identity formation without the danger of exposure to physical contact with peers. Katz and Rice (2002) suggested that the Internet offers many opportunities for teenagers to experiment with their identity without the threat of rejection, social backlash, or other negative real-world consequences. Because of its existence outside the plane of their "real" life, the Internet provides the safety of anonymous peer-to-peer relationships. Another prominent way in which adolescents

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experiment with their identity construction and identity verification on the Internet is through the construction of personal web pages; personally-focused electronic documents published by individuals on the web (Stern, 2004). Personal web pages are aimed to provide information about the identity, beliefs, social practices, and preferences of the author. By 2001, one-fourth of the youth who were regularly using the Internet had a homepage that they self-authored. In 2007, that number was higher (up to 55%), given that Internet use among adolescents has increased (Lenhart & Madden, 2007). Schmitt, Dayanim, and Matthias (2008) presented evidence that teens construct personal homepages to gain a sense of mastery in addition to developing and experimenting with their identity. The authors hypothesized that the interaction of a teen with their computer and the ability to create something as a form of self-expression (i.e., a personal homepage) satisfies a mastery motivation that children and adolescents possess. In addition to mastery motivation satisfied by the construction of a personal homepage, the authors also found that children are attracted to Internet communication and homepage construction because they allow the relative safety of social contact that is fairly isolated from those in real life.

Examining adolescents' experimentation with identity on the Internet, Valkenburg and Peter (2008) found that the consequences of adolescents' identity experiments online were both positive and negative. The positive consequences of online identity formation and online communication were that less socially competent teens were able to practice communication with a wide variety of people. This not only helped them affirm their self-concept but also allowed them to transfer their newly learned online communication skills to their offline lives. The negative consequences of identity experimentations on

the Internet were tied to the anonymous nature of online communication. Teens who

relied primarily on Internet-based forums of self-expression and social interaction were

less inhibited while talking online. However, when social interaction was implemented

in an offline setting, many teens had less skill and desire to engage with real peers and

developed a preference for online interaction. The process of identity formation is a

complex one with many components. In addition to the psychosocial component of

identity formation, teens also must engage in behaviors that will allow them to develop,

validate, and experiment with their identity. For this reason, it is important to review the

relevant research literature on the role that the Internet and primarily Internet based

communication play in the behaviors that teens engage in on and offline.

    Impact of the Internet on the behavior of adolescents.

    According to existing research on the impact of media on the attitudes and behaviors

of teenagers and adolescents, media influences both attitudes and behaviors of teens. As

an example, the super-peer theory posited that the media may represent a source of

information as to the appropriate peer behaviors and conduct. This source may exceed the

influence of traditional peer groups (Escobar-Chavez, Tortolero, Markham, Low, Eitel, &

Thickstun, 2005). Another theory, the media practice model, suggested that teens choose

media based on its contribution to help them express who they are or who they want to be

at the moment. This will enable them to verify their continuously changing identity

(Steele & Brown, 1995).

    A few studies have examined the specific impact that Internet communication and

Internet involvement has on the behavior of teens. For example, Dehue, Bolman, and

Völlinck (2008) found that youngsters engage in online cyber bullying, a behavior similar

to traditional bullying; that is defined as involving psychological violence, being repetitive and intentional, and because of its online nature is very often anonymous. The rate of cyber bullying among children and adolescents ages 10 to 19 was found to increase with age, in which approximately 4% of the younger (ages 10 to 14) children in the sample have encountered repetitive cyber bullying, whereas that percentage was 25% for the older (ages 15 to 19) participants. In its more severe forms, the authors found that cyber bullying may include posting the target's picture on the Internet without permission, sending threats over email or instant messenger programs, or making unwanted sexually oriented comments or advances. Similar findings were reported by researchers in Turkey in which 35.7% of secondary school children were found to have displayed bully-type behaviors and 34% were found to have displayed bully-victim behavior (Aricak, Siyahhan, Uzunhasanoglu, Saribeyoglu, Ciplak, Yilmaz, & Memmedov, 2008).

An important component of adolescence is teenagers' emerging sexuality, ranging from experimentation with sexuality (i.e., talking about sex with others, viewing or reading materials of a sexual nature, etc.) and sexual identity to physical engagement in sexual activity. Children and teens have always turned to the media for answers about the formation of their gender identity and sex (Borzekowski & Rickert; 2001, Brown, 2004; Johnson-Vickberg, Kohn, Franco, & Crinit, 2003). This trend continues to be true with the advent of the Internet as the newest type of media (Subrahmanyam, Greenfield, & Tynes, 2004). The Kaiser Family Foundation (2005) fact sheet on U.S. teen sexual activity reported that 47% of 9th through 12th graders were sexually active in 2005 and 14% of those who were sexually active reported having had multiple sexual partners. At

present, there are only a handful of studies that explore children's and teens' use of the Internet as a forum for discussing and defining their sexuality and its impact on the behavioral decisions with regard to sexual activity. For example, Subrahmanyam, Greenfield, and Tynes (2004) examined teen chat room content and its pertinence to the issues of sexuality and identity. They found that teens used online chat rooms for the purposes of discussing their sexual beliefs and current practices and to show support, solidarity, or disagreement to their peers. This finding supports the identity formation process discussed by Grotevant (1987a) who proposed that the first step in an identity formation process is taken during adolescence. Because sexuality is an integral part of one's identity, online forums for the discussion of sexuality allow teens to have a safer place for this aspect of identity formation than more conventional peer-to-peer interactions. Moreover, Subrahmanyam, Smahel, and Greenfield (2006) examined the difference in content between monitored and unmonitored chat rooms. The authors found that teens in monitored chat rooms (those chat rooms that are monitored by a chat host who enforces basic behavioral rules and removes repeat offenders from the chat room) were less likely to engage in explicit sexual conversation, were more likely to self-identify as younger (ages 10 – 15) and be female. However, in chat rooms that were not monitored by a chat host, participants were more likely to use sexually explicit language, make sexual advances towards others, self-identify as older (ages 16 – 24), and be male. Furthermore, it was found that 14% of participants with online nicknames conveying a masculine identity contributed to sexually explicit comments and 19% of participants with online nicknames conveying a feminine identity (e.g., *Lilprincess72988, MandiCS12*) contributed to sexually explicit chatting.

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Teenagers also frequently maintain online journals known as "blogs". Blogs contain written text, pictures, videos, and other media that are updated by the person who maintains them, usually known as a "blog administrator" on a daily, weekly, or monthly basis (Mazur, 2005 c.f. Mitchell, Wolak, & Finkelhor, 2008). According to the 2005 PEW Internet & American Life Project study, 19% of youth (ages 12-17) Internet users maintained or created their own blog. Twenty-five percent of girls, ages 15-17, wrote their own blogs as opposed to 15% of boys in that age range and 18% of boys and girls ages 12-14. Teens who write blogs know more about technology than non-blogging teens and are more likely to spend time online (Lenhart & Madden, 2005). Mitchell et al. (2008) examined whether teens who maintained an online blog are more likely to be sexually harassed or solicited online than their non-blogging counterparts. The researchers found that young people who maintained an online blog reported a higher incidence rate of online sexual solicitation and sexual harassment than peers who did not have a blog. Likewise, teens who maintained a blog were more likely to be sexually harassed or solicited online than those teens who did not maintain a blog, but communicated with others online.

In addition to experimentation with identity involving psychological and behavioral components, the Internet has also impacted the way that children learn. Young (2008) proposed a model of children's Internet-mediated learning consisting of three distinct components: the society, the Internet as a learning tool, and the individual (i.e., child). She argued that the Internet creates a learning environment for children through its unique design features and the ability to communicate societal knowledge. By actively engaging in goal-oriented activity while using the Internet, children develop unique

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cognitive and learning skills that allow them to process, synthesize, and comprehend information.

Thus far, the impact of the Internet on the psychosocial and behavioral aspects of teens has been reviewed without the consideration of other salient factors that are present in the lives of adolescents. Specifically, the impact of the Internet and its use by teens as a means of identity, sexuality, and social skill experimentation is perhaps somewhat moderated by the parental involvement of the particular child or teen Internet user. The role that parents play in the lives of teenagers is a complex one and although a thorough discussion of that role is beyond the scope of the present paper, it is certainly an important one to examine in terms of the today's children's and adolescents' access and interaction on the Internet.

Parental Involvement and Impact on Teenage and Child Internet Use

Parents play an important role in the development of their children. This statement can be supported by an abundance of research on the topic from various fields of social science and medicine. However, because the use of the Internet became widespread and accessible to most households in the United States and the world, social scientists have not kept pace with the research on its impact on children and teens and the role that parents play in this relationship. For this reason, there is limited literature on this topic and experimental studies are almost non-existent. Nonetheless, survey-based reports of parental attitudes towards Internet use and the media have been conducted and report very interesting and pertinent findings.

In 2007, the Kaiser Family Foundation conducted a nationwide telephone poll of 1008 parents of children aged 2-17 aimed at exploring how parents view media in their

children's lives. Seventy eight percent of the surveyed parents indicated that they have

Internet access in their home and 13% indicated that there is a computer connected to the

Internet in their child's room. These results imply that parents are not concerned about

and even encourage their children's Internet access and Internet-related activities.

Furthermore, 73% of parents indicated that they know a lot about what their child is

doing online (e.g., with whom they are communicating, what sites they visit, and what

they have posted). Most parents reported that they check the names on their child's

instant messenger program (IM) "buddy list" (87% of those whose children use instant

messaging). For example, 82% of parents whose kids have a profile on a social

networking site such as MySpace and Facebook reported that they have checked their

kids' profile, and 76% of parents reported having checked what websites their children

visit (Rideout, 2007). Moreover, according to the PEW Internet & American Life

Project, more households have rules about the Internet than any other media.

Approximately 85% of the parents of online teens reported having rules about the sites

that their children can visit as compared with 75% of parents having rules about what

their child can watch on TV (Lenhart & Madden, 2007).

Overall, these results offer a positive portrayal of parental involvement in the Internet

lives of their children. There are, however, concerns of which parents are unaware. One

of those is children's exposure to adult and sexual content on the Internet (Cooper,

Scherer, Boies & Gordon, 1999; Mehta, 2001) whether purposeful or inadvertent

(Mitchell, Finkelhor, & Wolak, 2003; Mitchell, Wolak, & Finkelhor, 2007). This

exposure has a mostly negative effect on young children's and adolescents' psychological

well-being and may even affect social skills and interactions with peers.

An issue that has not been widely discussed in the research literature concerns the

parental online exposure to adult content and its relationship to children surfing similar

sites. Findings indicated that although men are more likely to engage in online sexual

activity, women are becoming a larger presence on the Internet with regard to such

activity (Cooper, Scherer, Boies, & Gordon, 1999). Additionally, according to a study of

user demographics in online sexual activities in which over 7,000 participants were

surveyed on the Internet, 34% of the females and 45% of the males were married

(Cooper, Morahan-Martin, Mathy, & Maheu, 2002). Although no statistics were reported

with regard to the parental status of the participants, it is reasonable to assume that some

of them had children who were living in the home and likely using the same computers as

their parents. Certainly, this issue warrants further research. Furthermore, recent

research suggested that fathers play a more prominent role in children's cognitive and

social development than previously thought and potentially have an impact on the type

and the amount of Internet in which their children engage. This influence is particularly

statistically significant as children move into the teens and early adolescence when they

require more than just the fulfillment of their basic biological needs for which mothers

are still primary caretakers (Paquette, 2004). A study conducted by Lei and Wu (2007)

examined the relationship between adolescents' (ages 11 to 19) paternal attachment and

their Internet use along with the types of services that were used by the adolescents. The

results indicated that adolescents using the Internet more frequently felt more alienated

from their fathers. Conversely, trust and communication were statistically significantly

and negatively correlated ($r = -.23$, $p < .01$) with Internet use, yet, this relationship is

somewhat low (Cohen, 1988). Furthermore, children who had positive relationships with

their fathers exhibited less preference for using the Internet for communication purposes than children who did not have a positive relationship with their fathers.

Most parents do not want to harm their children; however, they may be either misinformed or simply uninformed about the potential negative consequences of their behavior. For this reason, it is important to warn and educate parents with regard to not only the online activity of their children, but also as to how their own activity may lead to their child's deleterious behavior or to negative effects on their child's physical and psychological well-being.

Parental struggle between benefits and detriments of the Internet.

Research suggests that parents struggle to view the Internet as a beneficial versus a negative influence in their children's lives. In 2007, the Kaiser Family Foundation found that 59% of parents believed that the use of Internet by their children has a mostly positive influence in their children's lives and only 7% reported that it has a negative influence. However, a common complaint that parents reported was the negative influence that the Internet had on their children when they use it while at school or at a friend's house, outside of the scope of parental monitoring (Rideout, 2007). Hughes and Hans (2001) reported that even though parents liked the benefits that their children attain from using the Internet, such as help with homework and communication with distant relatives, most parents also reported concerns that while using the Internet, their children are less social and less likely to have face-to-face interaction with other members of the household. A study of socio-demographic characteristics and their relationship to children's Internet use revealed that low household income and low academic performance in mathematics and reading have predictive relationships to the types of

websites visited by youth. Youths with lower academic performance scores were more

likely to visit gaming and pornographic websites than those with higher academic scores

(Jackson, Samona, Moomaw, Ramsay, Murray, Smith, & Murray, 2007). These reports

are suggestive of contradictory attitudes that parents hold toward the Internet and its

influence on their children or in the least of conflicting attitudes that should, perhaps, be

held by parents. Although parents are concerned with their children's Internet use

because of increased exposure to potential threats they also feel that the Internet is an

invaluable (and perhaps time-saving) educational tool (Mitchell, et al., 2008). Another

factor influencing parental perceptions of the Internet may be their lack of technological

awareness and the emergence of the so-called "digital generation gap" among today's

parents and their offspring.

The concept of the "digital generation gap" (DiMaggio et al., 2001) refers to the

notion that today's children are more savvy and knowledgeable when it comes to using

and navigating the Internet than are their parents. For this reason, it may be the case that

parents are simply not aware of the dangers that the Internet presents for their children or

are not aware of the possibilities of the Internet's negative effects. Another example of

the possible existence of a "digital generation gap" is illustrated by Valkenburg and

Buijzen (2003) who examined the types of activities that children engage in on the

Internet and the types of websites that they visit. The researchers found that 28% of 7-9-

year olds and 46% of 10-13-year-olds use instant messaging or chat websites. However,

only 40% of the parents in the sample knew how to access instant message programs and

about 60% knew how to access at least one chat website. Therefore, children seem to be

more Internet savvy as compared to their parents.

More support for the existence of the "digital generation gap" can be found in the 2007 Kaiser Family Foundation survey of parents and children with regard to their media use habits and knowledge. When parents were questioned with regard to their awareness of the current TV programming and movie ratings, on average 70% of the parents did not know what any of the letters in TV programming and movie ratings represented. However, 86% of the parents in the sample reported that they have used movie ratings at least once when making a decision about the appropriateness of a movie for their child, a finding that is somewhat contradictory as to the actual state of parental knowledge of the TV rating system. Moreover, 54% of the parents reported that they find movie, TV, music, and video game ratings useful when making decisions about appropriate programming and entertainment for their children. Again, this finding is misleading, because even though parents reported that they find the ratings useful, they also reported that they do not know what the ratings mean.

In 1999, the Federal Communications Commission (FCC) adopted rules requiring all television sets with picture screens 33 centimeters (13 inches) or larger to be equipped with features to block the display of television programming based upon its rating. Subsequently, this technology became known as the "V-Chip." (FCC, 2000). When questioned about the V-chip, 82% of the parents reported that they have a V-chip equipped TV (the presence of the V-chip was measured by asking about the size of the television set monitor and the year that the equipment was manufactured). Interestingly, however, among all parents who owned a V-chip equipped TV, 57% were not aware that they had it and of those who were aware of the V-chip, 54% have not used it for various reasons, among which was the lack of technical knowledge (Rideout, 2007).

Similar parental monitoring trends have been demonstrated with children's use of the Internet. The 2007 PEW Internet and American Life Project reported that only 53% of the parents who were surveyed as part of the sample have a filter software installed on the computer that their child uses at home (filter software is a type of software that prevents the user from visiting certain sites). Forty five percent of parents reported that they use another type of program or monitoring software to record sites that their children visit on the Internet. Although these numbers are encouraging, half of the teens in the sample reported that they are aware of both the monitoring software and the filters and about 38% reported that they know how to either circumvent the software or turn it off (Lenhart & Madden, 2007).

In addition to software-related means of monitoring their children's behavior on the Internet, parents employ other measures in an attempt to keep their children safe on the web. Eighty-five percent of parents have rules about what type of information their children can share on the Internet with others. Sixty nine percent of the parents said that they restrict the amount of time that their child can spend online, compared with only 57% of parents who restrict television viewing and video game playing time.

Seemingly, parents today are aware of the potential dangers of the Internet as evidenced by their monitoring behaviors, although most of them consider the Internet as a generally positive influence in the lives of their children with only one in five parents (20%) reporting that their own children witness inappropriate content in the media (Rideout, 2007). Moreover, parents believe that the responsibility of policing the detrimental or unsafe aspects of the Internet influences should fall to someone else, such as a body or branch of government. In fact, 66% of parents said that they would favor

new regulations to limit the amount of sex and violence in the media (Rideout, 2007). Of substantial relevance is an examination of the literature and documentation outlining the amount, type (e.g., voluntary or involuntary), and frequency of children's exposure to adult content on the internet and the effects of such exposure.

Children's and Teens' Access to Adult Content on the Internet

Although the general impact of the Internet is considered more beneficial than detrimental to children as the previously reviewed literature suggests, children's access is not limited to strictly child-oriented or innocuous websites. Through the Internet, minors today can access any information available to the general public, whether purposefully or accidentally. One type of deleterious content that minors (i.e., those under 18 years of age) can access on the Internet is content meant strictly for adult consumption. In most instances, this sexually explicit content is transmitted in the form of images, videos, sound bytes, or chat rooms. For the purposes of the present paper, adult content (AC) will be defined as any material directed for consumption of persons over 18 years of age containing violence, inappropriate language, or themes of a sexual nature. Limited research exists on the topic of the amount and type of access that minors have to adult-targeted content. For example, one study stated that 335 of their child participants (no ages provided) admitted chatting with someone online who later admitted to be 5 years or more older than they originally stated, 40% of children admitted to having engaged in a chat room conversation of a sexual nature, and 25% said that they have been solicited for an in-person encounter (Kennison, 2005). Yet, one question concerns the intent of the minor. That is, do minors intentionally seek out adult oriented material on the Internet or

is the exposure primarily inadvertent making the minors who encounter adult content on the Internet victims of such exposure (Mitchell, Finkelhor, & Wolak, 2003)?

Inadvertent exposure to adult content on the Internet.

A national survey funded in part by the Center for Missing and Exploited children was conducted in 2007 to explore the issue of unwanted exposure to sexual material on the Internet by minors. One of the findings of the survey was that one quarter (25%) of youths ages 10 to 17 who used the Internet regularly had one or more involuntary exposures to sexual material online within the preceding year. Most of the involuntary exposure (67%) happened while the children were using the Internet at home, but about 15% occurred while at school, and 3% at the library or other educationally related settings (the remaining 15% were not accounted for). Although most of the imagery (83%) was reported to have been of nude persons, 32% of the imagery was of people having sex and 7% involved violence in addition to nudity and sex. Older youths were more likely to have been involuntarily exposed to pornographic material, with 60% of exposures having happened to children over 15 years of age. Although 57% of the youths told someone about the exposure, an alarming 43% of the youths did not tell anyone. No follow-up information was provided by the authors with regard to the 57% of youths who told someone about the incident. It is not clear as to whether a friend or an adult was notified. Some of the explanations that have been moved forward with regard to these statistics is that purveyors of Internet pornography and adult content try to trick people to access their sites by linking their sites to common key words, (e.g., sports, library, etc.) and by making their domain names versions of commonly misspelled ones (e.g., "whitehouse.com" or "disnie.com"). Because older children are more internet

savvy and use search engines and Uniform Resource Locators (URLs) to access materials on the Internet, their chances of encountering this type of material are increased (Mitchell, et al., 2003).

In 2004, the Congressional Committee on Government Reform heard testimony regarding the possibility of the inadvertent exposure to pornography on then newly emerging peer-to-peer file-sharing networks (Greenfield, 2004). A peer-to-peer file-sharing network is a leaderless network of computer users that does not go through the World Wide Web. Primarily, these networks were developed when it became illegal to download music on the Internet and essentially are a way to get around copyright laws. When teens access such networks, they do so with the exclusive intent of downloading or accessing music. Often, however, files containing pornographic materials are located on these file-sharing networks and embedded to respond to keyword searches that correspond to popular song titles or artist names. This issue may pose a statistically significant risk to minors who are inadvertently exposed to pornography without the intent or expectation to do so. As evidenced in a study in which young adults were asked to recall and describe one impactful media experience from their earlier lives and their responses to it; most reported negative memories. Specifically, the majority of the participants reported disgust, shock or surprise, and embarrassment (25%, 24%, and 22%, respectively) (Cantor, Mares, & Hyde, 2003).

Intentional exposure to adult content on the Internet.

Although inadvertent exposure to adult content may occur, current research indicates that children and teens use the Internet and other traditional methods (e.g., videos, magazines, etc.) to seek out pornography. In a national survey study on intentional

access to pornography, 20% of the 10-to-17-year-old sample reported seeking

pornography on- and offline. A moderately positive correlation was also found between

the time that a child spends on the internet and their incidence of intentional pornography

exposure (Ybarra & Mitchell, 2005).

Another important aspect of children's and adolescents lives that has been impacted

by the Internet is the development and emergence of sexuality and sexually themed

identity experimentation. Because of a natural interest in their emerging sexuality,

research shows that adolescents use chat rooms and file-sharing websites to explore

sexual themes (Subrahmanyam, et al., 2004; Subrahmanyam, et al., 2006). Sometimes,

however, this exploration leads to both intentional and unintentional exposure to

pornography and adult material presented by peers, usually with the intent of (mostly

done by male to female adolescents) agreement to engage in sexual activity (Kraus &

Russell, 2008). The youth demographic that is especially likely to seek out pornography

online are the lower socio-economic status males (Ybarra & Mitchell, 2005) and children

older than 14 years of age (Lenhart & Madden, 2007).

Arguably, adolescents' exposure to sexually explicit material is a contributing factor

in their sexual activity and practices. This exposure often takes place over the Internet,

not only due to a lack of Internet content regulations, especially ones aimed at teenagers

older than 14 years of age (discussed in subsequent sections), but also because it is a

setting that provides a great amount of anonymity as to the activities conducted therein.

Current Laws for Protecting Children on the Internet and in the Media

Parents and caretakers are not the only individuals who are responsible for

safeguarding their children from the dangers posed by the Internet and various other

media content. Laws and legislature, which aim to protect the rights, safety, and identity of minors in the media are also prevalent. However, the issue lies in the effectiveness and capacity of current laws to protect the rights and interests of the individuals for whom they were designed. This notion is reflected by the parents who participated in the 2007 Kaiser Family Foundation study on families and the media. In the study, the majority of the parents reported that they saw inappropriate media primarily as someone else's problem (only 20% of parents reported that their *own* children are seeing a lot of inappropriate media). Moreover, surveyed parents looked to the lawmakers and the government to aid in protecting their children from potentially negative effects of the media, with 66% of the parents favoring new regulations to limit the amount of sex and violence in the media (Rideout, 2007). It is useful, therefore, to briefly examine the laws and regulations currently in place to protect minors from the media.

Surprisingly, not many laws exist that aim to protect minors from the media. In 1996, the United States Congress passed the Communications Decency Act (CDA) in one of the first attempts to regulate minors' Internet exposure to adult content, primarily pornography, which was to be enforced by the FCC. The CDA attempted to criminalize and make liable those who knowingly transmit indecent or obscene material to persons under 18 years of age (FCC, 2008b). However, in 1997, the CDA was partially overturned by the US Supreme Court in the case of Reno v. ACLU (American Civil Liberties Union) on the grounds that it violated the First Amendment of the United States Constitution and that the CDA is too broad in terms of the content that it considers harmful to minors (Reno vs. ACLU, 1997).

In response to these court decisions, U.S. lawmakers proposed a new law, the Children's Online Protection Act (COPA), which was approved by the U.S. Congress in 1998. The purpose of COPA was to restrict the access of minors to information considered harmful to them on the Internet, namely, pornography and other adult-oriented content. However, the COPA, like the CDA was overturned by the United States Court of Appeals for the Third Circuit and continued to be struck down by various courts throughout the country because it was ruled partially unconstitutional (e.g., ACLU vs. Mukasey, 2008). The COPA was also found to restrict content that is lawfully allowed to be viewed by adults. Although the courts recognized this content as being harmful to minors, they believed the regulation violated the First Amendment (ACLU vs. Ashcroft, 2002).

Concurrent with the COPA, the Congress enacted the Children's Online Privacy Protection Act (COPPA) to address risks created when children under 13 years of age are coerced by commercial interests to share personal information on the Internet. COPPA was the result of an extensive effort by the Federal Trade Commission (FTC) to identify and inform industry and the public about the collection of personal information online and the issues that are associated with those practices. After finding that some of the information gathering practices may pose a risk to children online, COPPA was enacted to prohibit commercial interests from coercing a child to provide more information than is necessary (FTC, 2007). Seemingly, the enactment of COPPA would partially safeguard children who use the Internet from some of the dangers associated with its use. However, COPPA did not provide for the incidental or purposeful access of any adult content by minors. Moreover, COPPA did not carry a provision targeted at the

commercial interests who supply adult material on the Internet to criminalize or prohibit these materials from being consumed or accessed by minors.

In 2000, the FCC and the United States Congress made another effort to protect minors from deleterious content on the Internet by enacting the Children's Internet Protection Act (CIPA). CIPA addressed specific concerns about minors' access to offensive content on the Internet. CIPA required that schools and libraries who received discounts offered by the E-rate program (a need-based program which supplies discounts and funds to organizations which provide Internet access, telecommunication services, or other technological services to the public) be required to show proof of an Internet safety policy and enforcement of technology protection measures before such a discount could be received. The Internet safety policy outlined by CIPA includes: a) access by minors to inappropriate material on the Internet; b) safety of minors when using email, chat rooms, and other types of electronic communication; c) unauthorized access (i.e., "hacking"); d) unauthorized dissemination of information about minors; and e) restricting the access of minors to materials harmful to them (FCC, 2008a). In addition, the school and libraries that are subject to CIPA are required to monitor the activities of minors on the Internet. The major drawback of this regulation is two-fold. First, CIPA addressed only schools and libraries that received the E-rate program. The schools and libraries that did not receive E-rate funding remained unmonitored. Although the argument can be made that minors are not sophisticated enough to differentiate between such places and will most likely use a place that is geographically convenient for technology and Internet use; adults who prey on minors on the Internet are likely to be sophisticated enough to differentiate between CIPA-regulated and non-regulated places. Another problematic

aspect of the CIPA is that an authorized individual within a CIPA-regulated

establishment can disable the blocking or filtering measure during any use by an adult.

This clearly introduces the issue of human error. Much of the enforcement of continual

protection of minors depends on the authorized individual who may erroneously forget to

turn the protection on and off as necessary. In 2001, the American Library Association

(ALA) with the aid of the ACLU successfully challenged the CIPA on the grounds that

the regulation requires libraries to unconditionally block Internet material that is

protected by the United States Constitution. The Court of Appeals for the Eastern

District of Pennsylvania ruled that because the filtering technology required by CIPA

severely limits Internet access and less restrictive alternatives are available, it is not

possible for a public library to comply with the CIPA regulations without blocking

constitutionally protected speech (American Library Association, Inc., et al. vs. United

States, 2002).

Finally, the Deleting Online Predators Act of 2007 (DOPA) was brought as a bill

before the United States House of Representatives (H.R. 1120). The DOPA was drafted

as an amendment to the Communications Act of 1934 (the same act that the CDA tried to

update in 1996) and was specifically intended to target predators who use the Internet to

target, find, befriend, and eventually prey on and exploit minors. Again, similar to CIPA,

DOPA targeted schools and libraries who used the E-rate program funds requiring them

to protect minors in the absence of parental supervision from accessing commercial social

network websites and chat rooms.

Although the U.S. government has made attempts to introduce legislature which

would protect minors from the negative effects of the Internet, most of this legislature has

either been found partially unconstitutional or does not reach far enough, thereby only encompassing programs that are directly controlled by federal funding. Some states have passed individual laws, which restrict minors' access to social networking sites (e.g., North Carolina Protect Children from Sexual Predators Act, Illinois Social Networking Prohibition Act) by penalizing operators of social networking sites who allow minors to create profiles without parental consent (Wikipedia.org, 2007). Hence, the Internet remains a somewhat dangerous place for children both in terms of exposure to adult content and exposure to adults who prey on children in order to exploit them. Nevertheless, the government appears more concerned about the rights of the adults than the welfare of children by continually ruling laws and actions that attempt to limit content that is dangerous to minors in favor of the free speech rights of adults. However, research shows that children are exposed to adult content on the Internet and are also solicited in a sexual manner by predatory adults. For this reason, it is important to warn the children themselves of the dangers that they may encounter on the Internet. Therefore, a warning system is needed that targets the children who use the Internet, rather than relying on adults who sell, post, and otherwise disseminate adult content on the Internet. Likewise, it is important to examine systems of access prevention that currently exist and to determine their effectiveness.

Current Internet-Based Systems for Preventing Children's Access to Inappropriate Content

The Internet contains a wide variety of consumer-oriented warnings. For example, a popular and well-researched warning is one that cautions consumers about their privacy online, especially when making purchases on the Internet or entering personal

information (for a review, see Chen & Rea, 2004; Goldman, 2003; Larose & Rifon, 2007). Recently, various anti-virus software companies have developed Internet safety features for their software. These features allow the user to be aware of websites that engage in "phishing", the criminally fraudulent practice of posing as a legitimate website in order to gather personal information about users such as names, social security numbers, and passwords (Webopedia, 2008).

Another type of software called "content control software", web control software", or "censorware" is available to parents who seek to limit the type of websites that their children can access by methods other than closely monitoring their children's activity online and limiting their time on the Internet. This type of software is designed to block specific Internet content on a particular computer. Some software brands provide the option of chat, newsgroup, and email monitoring, whereas others only provide the option to enter keywords that should be blocked. The type of content that is blocked depends upon the owner of the software. Most commonly blocked content includes information or images that parents find objectionable or inappropriate for their children to view. The software is available for purchase from many stores and online websites and it ranges in price from about $29.00 upwards of $70.00, depending on the variety of features that the consumer is interested in accessing (Top Ten Reviews, 2008).

The issues and challenges associated with employing content control software to prevent children from accessing undesirable content on the Internet are quite obvious. Because filtering software indiscriminately blocks content based on syntax, in some cases it may be more detrimental than useful. Some of the filtering software that are on the market today allow the user to block specific Internet protocol (IP) addresses. IP

addresses are numerical identifications that are assigned to computers participating in a computer network. A seemingly useful feature, IP blocking is rendered useless when purveyors of adult content on the Internet change their IP addresses for the specific purpose of avoiding detection (FTC, 2007). Finally, computer software may be costly investments. A large proportion of individuals and families with children either cannot afford the filtering software itself for their home computer or are not computer-savvy enough to know of its availability (Lee & Chae, 2007).

Another way that parents can prevent their children from accessing undesirable content on the Internet is by subscribing to an Internet service provider who blocks or otherwise censors the type of websites that can be accessed. The problem is that not all service providers have content censoring options available to their consumers. Moreover, there is an extra cost associated with such a service, which consumers either cannot afford or they may be ignorant that there is such a service available to them from the provider.

These problems associated with the currently available methods to parents and guardians for safeguarding their children from undesirable content on the Internet illustrate the need for a different warning system. One possible system does not block or take away objectionable content by an adult, but rather it cautions the child to make the safer choice while using the Internet. Indeed, warnings are effective ways to safeguard consumers from materials, objects, and situations that may pose a potential threat or danger to their physical and psychological well-being. Therefore, a system of warnings aimed at children who intentionally or unintentionally try to access adult content on the Internet may prove to be more effective than a software-based parental control.

To date, only a handful of academic publications have addressed the need for a comprehensive Internet-based system of warnings targeted at children to safeguard them from legal and illegal materials on the Internet which may be detrimental to their physical and psychological well-being. For example, Dombrowski, Gischlar, and Durst (2007) reviewed the statistics of children's Internet use today and the laws that are in place to protect children on the Internet. A large portion of the publication focused on the Internet's potential to deliver pornography and other potentially harmful materials to children in this new venue (i.e., as compared to the more traditional way through publications and television) and the methods that online predators use to access, contact, or solicit children. Solutions to the problem such as contacting the local, state, and federal authorities were discussed and options for protecting children from the dangers of the Internet were suggested. Some of these options were to ensure proper supervision on the part of parents and caretakers, the necessity to emphasize and discuss Internet dangers with children, supervising Internet friends, being aware of Internet nicknames, and establishing a public computer location in a shared space. Williams (2005) focused on using warnings to dissuade children from viewing pornography. In her work, the author discussed two primary issues that warnings on the Internet can be used for: a) protecting children from legal pornographic images; and b) preventing the viewing of illegal child pornography. One of the issues not discussed in Williams' (2005) publication is the Internet as an avenue by which children can access sites that allow them to chat with unknown others. These sites, which are minimally or not at all regulated, especially with regard to the participants' age, can potentially be very dangerous to minors because they may place minors in contact with individuals who prey on them in many ways. A

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sizeable amount of research has shown warnings to be effective in a variety of situations that call for cautionary notices to end-users and consumers. Warnings images and statements have been researched and developed over a span of several decades. A review of the relevant warnings literature may guide the development of an appropriate set of warnings that are targeted specifically at children with the purpose of safeguarding them from the more dangerous aspects of Internet use.

Warnings Research: A Review

Although warnings are not a suitable substitution for a well-designed safe product or environment, they are widely used as a means of informing the end-user of potential danger or negative consequences. The history of warnings in the United States and Europe can be traced back to as early as the mid-1800's when manufacturers of dangerous or poisonous products used different colors, shapes, and words in the packaging of their goods to warn consumers of the dangers associated with the products (Egilman & Bohme, 2006). Over the past thirty years, there has been a considerable amount of regulations, standards, and recommendations for warnings on the part of legislative and governing bodies (Wogalter, 2006a). Warnings can be used with many situations and products, such as roadside hazards, medications, equipment, and chemicals. They can also be used to modify behaviors that do not lead to a specific physical injury, but may instead have negative psychological effects or other consequences. For example, much of the anti-virus software available on the market today include a feature that informs the consumer about the potential dangers (i.e., spyware, viruses, identity theft, etc.) of accessing certain websites while using the Internet.

Every warning must do at least one of the following: a) communicate important safety information, b) influence people's behavior to increase their safety, c) reduce or prevent health problems; d) function as a reminder to already informed persons about the appropriate behavior in a situation or with a product (Wogalter, 2006a). To be effective, the warning must not only be salient but also be able to appropriately communicate its intended message.

The majority of the warnings in use today are made up of three major components, at least two of which are usually present in every warning: signal word (e.g., DANGER), color, and symbol (i.e., the warning image or icon). Variation exists within each of the warning components. For example, signal words, may be presented in different colors, fonts, or have different placement on the warning. The signal words on a warning may also vary depending on the message that they are attempting to convey (Braun & Shaver, 1999). Color is frequently used in warnings to convey the amount and type of hazard (Adams & Edworthy, 1995; Braun & Silver, 1995). Previous research has shown that some colors elicit a higher perception of danger whereas other colors have a more calming or soothing effect. Another component of most warning signs is a symbol (also known as an icon, pictograph, or pictorial) that usually accompanies the signal words or sometimes stands alone as a warning. Symbols enhance the recall of warnings (Young & Wogalter, 1990) and vary in their explicitness. The explicitness of the warning symbol usually enhances the communication of a hazard warning (Braun & Shaver, 1999). In addition to these components, some warnings also include a message or a statement about the type of hazard one may encounter if using a product or performing an action incorrectly. The message usually contains the hazard information about the product or

situation, instructions for proper use, and the types of consequences that may occur if the proper use instructions are not followed (Wogalter, 2006a).

Each of the above components of warnings has been considerably researched and some guidelines for the use of color, symbols, and signal words have been established in the literature. The review of warnings in the present paper will encompass the past and present research on each of the warning components in order to establish a guideline and rationale for the composition of warnings. These components will then be applied concerning the dangers of minors' access of adult content on the Internet.

Warning icons and image explicitness.

One of the most prominent and arguably most noticed features of a warning sign is the symbol, image, or icon that is included in the warning. The main purpose of warning pictorials is to promote safety and to facilitate compliance. An effective warning should be legible, understandable, and must call sufficient attention to itself for the end-user to notice it and any messages that is it attempting to communicate (Wogalter, Silver, Leonard, & Zaikina, 2006). Concrete pictorials (e.g., a pictorial depicting a lightning bolt to indicate electric shock) have the ability to be understood by consumers and end-users by communicating hazard that is not dependent on language (Brelsford, Wogalter, & Scroggins, 1994). The American National Standards Institute (ANSI) recommended that warning and hazard symbols be placed on products and in environments that may be dangerous to users (ANSI, 2007). However, safety standards issuers, such as ANSI, usually recommend a variety of safety symbols for the same type of hazard (e.g., electric shock) without considering the possibility that different warnings pictographs may convey different levels of danger.

Alves-Foss, Thomas, and Braun (1995) compared three versions of warnings for the same type of hazard that varied in their explicitness. The authors defined explicitness as how specifically potential injuries stemming from exposure to the hazard were depicted (for an example, see Figure 1). They found that the most explicit of the illustrations produced the highest perceived hazard ratings and the least explicit of the depictions received the lowest hazard rating.
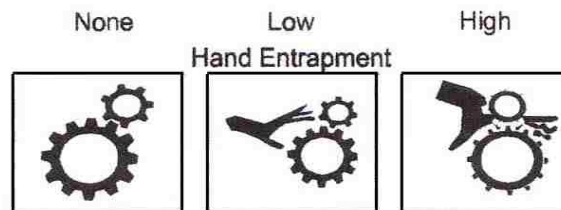
Figure 1. An example of hazard explicitness levels.

These results suggest that the warning pictorial may play a role in the communication of hazard, especially in the case of highly explicit pictorials, those that specifically define the potential injury that can be received from the hazard. Brelsford et al. (1994) used the training paradigm to determine whether comprehension of icons in warnings can be enhanced. The researchers included a post-instruction test in one of the conditions of the study to determine if its presence or absence of such a test influences the comprehension of pictorial warnings. In addition to the training paradigm, the difficulty level of the pictorial images (hard vs. easy) (see Figure 2) as well as the content of the label (verbal label only vs. verbal label plus explanation) were also manipulated. The researchers

found that participants remembered information best when they saw easy to understand

pictorials and were
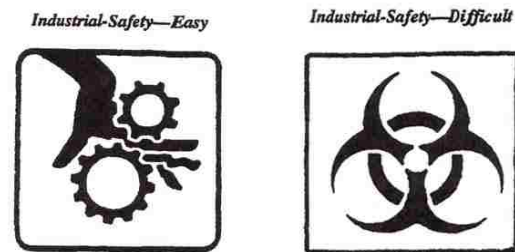
Figure 2. Easy and hard to understand industrial pictorials.

tested for recall either immediately following training or 7-10 days after the training. The

results of this study augment the results of the above study by Alves-Foss, et al. (1995)

who found that more explicit pictorials (i.e., those classified as "easy" by Brelsford,

Wogalter, and Scoggins, 1994) resulted in a higher level of hazard comprehension. The

combined outcome of these studies also suggests that images that are high in explicitness

and easy to understand communicate hazard best and are remembered better.

Silver and Perlotto (1997) examined the comprehensibility of aviation safety

pictorials in terms of gender and previous safety card exposure influences. Although no

appreciable gender differences were found in terms of participants' ability to understand

the pictorials, there were some differences in understandability among the types of

pictorials. Of the 40 pictorials examined in this study, 21 (52.5%) exceeded the

International Organization for Standardization (ISO) 67% criterion and only 11 (27.5%)

exceeded the ANSI 85% criterion. Overall, those participants who claimed that they had flown before were better at understanding most of the pictorials than those participants who have not flown. Additionally, pictorials in which only one piece of information was provided were better understood overall than pictorials in which more than one piece of information was provided. For example, a pictorial that only provided one piece of information such as "move handle in the direction of arrow" was better understood than a more complex pictorial whose message is "move away from the aircraft". These results illustrate that concrete pictorials, such as ones that clearly illustrate an object and represent the object or action at an operational level are better understood than abstract pictorials, those that illustrate two- or three-part actions and require a great amount of interpretation by the end-user (Garcia, Badre, & Stasko, 1994). Additionally, if complex pictorials must be used, they are more effective when accompanied by a message or perhaps when multi-part pictorials are numbered with regard to the sequence of steps to be performed in compliance with the warning. Likewise, Caird, Wheat, McIntosh, and Dewar, (1997) found that pictorials with the highest levels of understandability were ones whose were fairly simplistic (e.g., "Do not wear high heel shoes.", "Avoid the propellers."). The pictorials that yielded lowest levels of understanding, on the other hand were complex and usually included a compound message (e.g., "Do not smoke, put oxygen mask on self then child.", "Do not open the cabin door if there are hazards outside.").

Ringseis and Caird (1995) examined the comprehension of 20 commonly used pharmaceutical warnings. They found that many of the warnings were poorly understood and that most did not pass the ISO (67%) or the ANSI (85%) comprehension standards.

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In addition to measuring the understandability of pharmaceutical pictorials, Ringseis and Caird (1995) asked participants to help re-design the most poorly understood warnings in the second phase of their study and tested the understandability of the re-designed pictorials with younger and older participants. These findings showed that participants understood pictorials that closely depicted concrete concepts such as showing a slash (/) or an x (X) through a pictorial that prohibits a particular action. Additionally, younger participants understood the re-designed pictorials better than older participants. Similarly, McCafferty (1999) examined perceived readability, understandability, and hazardousness of prescription drug warnings as a function icon, font size, and color. Generally, her findings showed that icons that represent more concrete concepts, such as "Do not drink alcoholic beverages (martini glass with a slash through it) and "For the eyes" (a picture of an eye) were rated higher on all dependent variable measures than pictorials that were abstract. Abstract icons, ones that generally require a great amount of interpretation by participants were not very well understood or misinterpreted by participants. For example, an icon that means "For anxiety" (a head with lines around it) was generally interpreted as "may cause dizziness or lightheadedness" and "For water retention" (a person filled with black and white with a slash through it) was interpreted often as "not for human consumption". McCafferty (1999) also found that participants rated most icons higher on understandability, carefulness, likelihood of injury, severity of injury, and attention-getting qualities when text explanations were provided with the icons. This finding demonstrates that text in combination with icons is more effective in terms of hazard communication than icons alone. The provision of explicit context has also been shown to increase the comprehensibility of warning pictorials. Silver,

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Wogalter, Brewster, Glover, Murray, Tillotson, and Temple (1995) assessed whether warnings pictorials are understood better when accompanied by explicit context, in this case photographs and a verbal description. The authors tested warnings pictorials from the "Keep Out", "Electric Shock" and "Do Not Dig" categories. It was found that most of the warnings pictorials, especially ones from the "Electric Shock" and "Keep Out" categories benefitted from the presence of explicit context imagery. Less of an impact on comprehension was observed in the "Do Not Dig" category. The results of this study demonstrate that warnings are more understood, which increases their effectiveness, when they are companied by explicit context, which, in turn, aids in the comprehension of consequence in the event that the warning is not heeded. Notably, in the "Do Not Dig" category, participants' comprehension was less affected by the provision of explicit context because the danger of not heeding the warning is not visible (i.e., underground) and therefore less impactful.

Most research studies that examine warning pictorials are conducted with either American college students or other American (i.e., Caucasian) adults. It is important to consider other end-user characteristics. Because pictorials are designed to be a universal and relatively "culture-free" method of communication, it is important to consider other populations and their ability to understand warning pictorials. Studies have examined the understanding of pictorials by alternate (i.e., other than college student and "normal" adult) populations. One such study was conducted by Navai, Guo, Caird, and Dewar (2001) with participants who were native and non-native English speakers, low literacy participants, and those who were younger (26 to 64) and older (65 to 98). Participants were asked to review ten pharmaceutical warning images and write out what they thought

each one meant. Additionally, they were asked to rate how easy it was to understand each of the images. Overall, the lowest percentages of understanding were shown by the elderly participants and non-native English speakers, although the low literacy participants also found some of the images difficult to understand. In particular, participants had difficulties with understanding pictorials that lacked relevant information or those that lacked pertinent components. For example, a symbol that depicted a warning "Caution! Speak to your doctor before taking." included an exclamation point for "CAUTION", but lacked a component that symbolized the second message. Other poorly understood images were those that included multiple ambiguous parts. For example, the pictorial depicting the message "Take 2, then take 1 daily for 7 days." contains four images; two small pills with a numeral "2", an arrow pointing right, a large pill with the numeral "1", and a small tear-away calendar page with a numeral "7". Many of the participants interpreted this as, "Take 1 large pill or 2 small pills." because of the inconsistency in the size of the pills in the images. These findings are consistent with the Silver and Perlotto (1997) finding that the comprehensibility of the warning images seems to decrease as the number of parts that make up the image increase.

In a study which utilized participants with mild (IQs between 50 and 70), moderate (IQs between 35 and 55), and severe (IQs between 20 and 40) mental retardation, Silver, Basin, Sexton, and Fabbi (1998) found that only simplistic pictorials were understood. The pictorials that were most understood by the participants were: "Take with water", "Do not drink alcohol", and "Poison". Other pictorials such as "Shake well" and "Not to be taken orally" were understood by a small percentage of participants, and the more complex pictorials, "For infection", "May be refilled" were not understood. This study

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demonstrates the importance of diverse of the inclusion of diverse population in warning

pictorials design. Because some of the end-users (e.g., children, people with mental or

developmental delay, elderly, etc.) of warnings may have limited understanding of

warning pictorials, it is important to design pictorials that are less complex and may be

universally understood.

A more recent and perhaps more closely related study to the topic of the present paper

was conducted by Thomsen and Fulton (2007). Using an eye-tracking system, the

researchers investigated whether adolescent (ages 12-14) attended to drinking moderation

messages. Researchers used alcohol and non-alcohol advertisements to record variables

such as total viewing time, total number of fixations per advertisement, and the duration

of each fixation. In addition, each participant completed a masked recall task in which

they were presented with copies of advertisements that they had seen. Parts of these

advertisements were blacked out and these blacked out parts always included the

moderation message. Researchers found that the participants spent roughly an equal

amount of time looking at alcohol and non-alcohol ads. However, in both types of

alcohol advertisements (moderation message centered and non-moderation message

centered), participants spent the least amount of time looking at the responsibility

message. The part of the message that was looked at for the longest time was either the

headline or the product name for most of the ads. Over half of the participants did not

recall the responsibility message and roughly 5% of the participants recalled the general

concept of the responsibility messages; that is, the responsibility message warned them

about drinking, but they could not recall the exact wording or placement of the message.

This suggests that adolescents may concentrate on the pictorial images in an

advertisement and either (a) do not concentrate on the verbal message that is presented or (b) do not have enough cognitive sophistication to process the complex pictorials of an advertisement and a verbal message. Perhaps the inclusion of an icon or a pictorial in such warnings would raise the awareness and visibility of the warning to the teenage demographic. Adolescents may simply not pay attention to responsibility messages because the messages that were included by Thomsen and Fulton (2007) were fairly simplistic, (e.g., "Enjoy Amstel Light Responsibly", "Drink Responsibly", etc.). Another explanation for the results may be that alcohol is a product that 12-to-14-year-olds cannot purchase and cannot easily access; therefore, the prevention messages included in advertisements for these products are not pertinent to them and are simply not worth reading or remembering. A product or situation that is more relevant to adolescents such as Internet browsing might foster greater attention to a warning. Younger individuals and children are also more likely to be susceptible to social peer influence, and in contradiction to well-designed informative warnings may follow the actions of their social group (Wogalter, Allison, & McKenna, 1989). Finally, the warnings themselves were fairly ambiguous. It is difficult to conceptualize what "Drink responsibly" means, especially to a demographic that does not include many regular or recreational alcohol users.

Not many studies examine warnings as they relate specifically to children or adolescents. Instead, the existing literature is concentrated around the general effectiveness of icons and pictorials in warnings using college students or adult samples. Specifically, research needs to be pointed at prevention messages on the Internet,

messages that would target minors who may accidentally or intentionally access adult content.

The current body of research has demonstrated that pictorials in warnings help persuade the end-user to use caution or discretion when faced with a situation or product that the warning targets. Additionally, pictorials can be a more universal mode of communication than words or colors. A study on the effects of including a graphic warning in tobacco advertisements showed that those containing graphics are more effective than text only warnings. Telephone surveys conducted as part of a quasi-experimental study in Canada, the United States, United Kingdom, and Australia indicated that in countries where regulations mandated that graphic warnings be included on packages (Canada and Australia), smokers reported higher levels of awareness of risks associated with smoking than in countries where this is not mandated (Hammond, Fong, Borland, Cummings, McNeil, & Driezden, 2007). These results were supported by another laboratory based study on the same topic. Participants in this experimental study viewed tobacco product advertisements for different types of products. Half of the participants saw the advertisements with a standard U.S. Surgeon General's warning and the other half viewed the advertisement with a graphic depiction of a diseased heart or lungs in addition to the standard warning. Those participants who saw the graphic and a warning rated the appeal of the products statistically significantly lower than those who only saw the warning (Stark, Kim, Miller, & Borgida, 2008). These studies demonstrate not only the importance of graphics in the composition of a warning label, but also their ability to bridge the gap in the consequential knowledge of the use of a product or a behavior. Effective graphics should be able to communicate the negative consequences

and risks associated with the use of a product and preferably stand alone, apart from the signal words or messages that may accompany them. Because warnings are encountered by a wide variety of end-users, such as children, the elderly, and people who do not speak or read English, it is important that they include an easily understandable pictorial, which draws attention to the warning.

The current research on pictorials in warnings presents the overall message that the presence of pictorials in a warning message greatly increases the end-user's awareness and understanding of the message by either drawing their attention to the warning itself or enhancing their understanding of the risk associated with the use of a product. Bzostek and Wogalter (1999) found that in a visual search task, participants found warnings more quickly when they included a symbol and color. However, there were no statistically significant differences in search times among the types of symbol used (i.e., asterisk, Mr. Yuck, exclamation sign, etc.). Because children and adolescents are image-centered (Thomsen & Fulton, 2007) and the inclusion of a symbol greatly increases a warning's noticeability, warnings that feature prominent or unusual images easily capturing attention might be most appealing to children.

In addition to images, symbols, and pictorials, however, most warning messages and signs include signal words or signal words accompanied by a message of consequence or danger associated with a product or a situation. It is important to examine the effectiveness of particular signal words and messages that are typically included in warnings.

Perceived hazard of signal words and messages in warnings.

In addition to an image or pictorial included in a warning sign or label, the other most prominent feature of a warning is the signal word that is included (e.g., DANGER, WARNING, CAUTION). Usually, this word or words are more prominently displayed than other words in the warning (i.e., message words) and is placed at the top or center of the warning. The effectiveness of signal words has been a topic of numerous research studies, although there are some conflicting findings as to the most effective signal words and their perceived hazard, (Braun, Kline, & Silver, 1995; Braun & Shaver, 1999; Leonard, Matthews, & Karnes, 1986; Silver & Wogalter, 1991; Ursic, 1984; Wogalter & Silver, 1995) Additionally, most of the research concerning signal words involves not only the perception of each word's hazard, but also the influence of such variables as color, placement, and text or font type of the signal words. For this reason, it is challenging to tease apart the effectiveness of the word itself as opposed to the effectiveness of the word in a certain color, font type, or place. Thus, all of these factors will be discussed in this section of the review.

The most commonly used signal words are "DANGER", "CAUTION", and "WARNING" (Braun & Shaver, 1999). The word "Danger" is used to warn of a hazard the end-user *will* be exposed to and that will *likely* result in death or serious injury if not avoided and the words "Caution" and "Warning" are used to warn of a potential hazard the end-user *may* be exposed to and that *could* result in death or serious injury if not avoided (ANSI, 1999). The signal word "DANGER" has consistently produced the highest perceived hazard ratings than other words (Braun, Sansing, & Silver, 1994; Kline, Braun, Peterson, & Silver, 1995). However, it is unclear whether there is a difference in

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the perceived hazard ratings of the signal words "WARNING" and "CAUTION". For example, Braun, Kline, and Silver (1995) found that the word "WARNING" is interpreted as slightly higher in perceived hazard level than the word "CAUTION". On the other hand, Ursic (1984) found that the two words are equivalent in their perceived hazard level. Wogalter and Silver (1995) examined an expanded list of signal words with 4th through 8th grades, college students, elderly individuals, and non-native English speakers and examined the words for carefulness, strength, and understandability. The researchers found that younger students' evaluation of signal words were similar to those of college students with regard to carefulness. College students' understandability ratings were statistically significantly positively correlated with missing (i.e., those words that were not understood) ratings of the younger students. This implies that the words convey another dimension different from carefulness on which these students differ. Generally, results for the elderly and non-native English speakers were similar to those of the students. Similarly to the students, the elderly and non-native English speakers rated the word "DANGER" higher in carefulness than the words "WARNING" and "CAUTION". The word "WARNING" was rated statistically significantly higher than "CAUTION" by college students, elderly, and non-native English speakers, providing some support for a hazard level difference between these two words.

Although commonly used signal words (i.e., "DANGER", "CAUTION", and "WARNING") have the desired effect of communicating a certain level of hazard, some recommendation has been made (see Wogalter & Silver, 1990 and Wogalter & Silver, 1995) to use and research an expanded list of cautionary signal words (e.g., "ATTENTION", "NOTE", "URGENT", etc). The implications of such an expansion

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of signal word usage are two-fold. Different words convey different semantic meanings and some may be more or less applicable to a particular situation or product even though they may convey the same amount of hazard risk. For example, the word "DEADLY" would convey the right type of consequence if placed on a product or in an environment the improper use of which would result in imminent death. However, the word "Poison" may not be applicable if placed on a product or in an environment the improper use of which would result in imminent death even though it may connote exactly as much hazard risk as the word "DEADLY". The word "POISON" may be appropriate for products such as bleach, ammonia, or other harmful chemicals or gases, but it is not appropriate if placed on a product or object that may harm the end-user through electric shock. In some situations, however, it would be difficult to make the correct choice of signal word because two or more words would be equally salient. On the other hand, the use of the same signal words across situations and products may result in end-user habituation, which will lead to decrease of attention to warnings by consumers (Hellier, Aldrich, Wright, Daunt, & Edworthy, 2007). Additionally, special populations also need to be considered when the choice of signal word is made. Silver, Tubilleja, and Ferrante (1995), demonstrated this when they tested a list of 43 signal words with developmentally disabled persons whose IQs ranged from 20 to 70. Researchers found that among the developmentally disabled, 63% of the words on the list were left blank, which indicates that they were not understood. Although words like "STOP", "NO", and "WARNING" were not understood by less than 10% of the participants, words such as "RISKY" and "HALT" were not understood by more than 40%. If individuals do not properly understand the hazard communicated by the signal word, the implications are severe both

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physically and legally. The choice of signal words should be guided by target audience

factors in addition to product or situation variables.

Color of signal words and messages in warnings.

In addition to each signal word's communicative abilities when examined alone, the

effect of the word also depends on the word's color. A number of studies have examined

the effect of color and signal word combination with regard to their effect on perceived

hazard. For example, Braun and Silver (1995) looked at the effect of high (DANGER,

STOP) moderate (CAUTION, ATTENTION), and low (NOTICE, REMINDER)

connoted hazard level words printed in high (red), moderate (orange), and low (blue,

green, and black) hazard level colors. With regard to hazard strength, the results showed

that high saliency words (e.g., "DANGER", "STOP") were rated higher in perceived

hazard than moderate (e.g., "CAUTION", "ATTENTION") and low (e.g., "NOTICE",

"REMINDER") words, confirming earlier findings (e.g., Braun, Sansing, & Silver, 1994

& Kalsher, Brewster, Wogalter, & Spunar, 1995). Furthermore, the results also indicated

that there was an additive effect among the word-color group combinations, with the

color red yielding the highest mean ratings of perceived hazard across the high, moderate,

and low saliency words and the color black yielding the lowest perceived hazard ratings

(e.g., the word "DANGER", a high hazard word printed in red was perceived as more

hazardous than the word "DANGER" printed in black and the word "NOTE", a low

hazard word, was perceived higher in hazard when printed in red than in black). One

confirmed result of the Braun and Silver (1995) study was that the color red had the

highest effect in terms of perceived hazard and the likelihood of safety behavior

occurrence. However, Braun, Sansing, and Silver (1994) found that the color black was

rated higher than the colors blue and green in perceived hazard, yet the colors red and orange continued to be the top hazard communicators. Black was also found to be rated highest in communicating hazard among the colours black, blue, red, and orange by Silver, Drake, Niaghi, Brim, and Pedraza (2002). These results are indicative of the evidence that color, specifically red and orange, influences the perception of hazard and effects the strength of warnings. The augmentation of warning communication through color has also been shown to be consistent across different cultures. With the exception of yellow, subjects rated color words red, orange, blue, green, and white similarly across English, German/Austrian, Scandinavian, and Spanish/Portuguese cultures (Dunlap, Granda, & Kustas, 1986 as cited in Braun, Sansing, & Silver, 1994). Additionally, a statistically significant color by word interaction was also found by Silver and Braun (1995). The interaction indicated that higher hazard words printed in lower hazard colors were equivalent in perceived hazard to lower hazard words printed in higher hazard colors. For example, a high hazard word such as "DANGER" printed in blue was rated similarly in hazard communication as the word "NOTICE" printed in red. Of particular interest, however, was the statistically significant difference in hazard communication between moderated hazard words printed in high hazard colors (i.e., "ATTENTION" in red) and high hazard words printed in low hazard color (i.e., "DANGER" in black). In this case, the moderate hazard word was rated statistically significantly higher in perceived hazard than the high hazard word. This finding is important in terms of color choice because it illustrates that aesthetic properties of a product need to be secondary to warning design when trying to communicate product hazard. Often, manufacturers, and corporations design warnings to fit into their chosen color scheme or décor. This is a

dangerous practice that may ultimately lead to avoidable injury, litigation, or in its severe

form, death.

Overall, research on signal word color indicates that the colors red and orange

connote the highest levels of hazard communication, especially across cultures, with the

color black ranking a close third. However, for a maximum impact and perceived hazard,

the best combination of hazard word and color is one in which the two are congruent; that

is, both the hazard word and color are high, moderate, or low in their perceived hazard

ratings. Additionally, it is important that signal word color is considered in terms of the

hazard applicable to a product or situation before other factors such as the product's or

environment's color schemes are given consideration.

Font type and size of signal words and messages in warnings.

The effectiveness of a warning not only depends on its signal word but also its

message readability. This means that the type and size of font, and the placement of the

warning message on a product or in a particular environment have a combined effect on

how well a warning is understood and followed by the end-user. Generally, the inclusion

of an instructional message in warning signs increases the level of perceived hazard,

especially in cases where at least three or four components were present (i.e., signal

word, hazard, consequence, and instructions). On the other hand, signs with extra

information received lower hazard communication ratings (Wogalter, Godfrey,

Fontenelle, Desaulniers, Rothstein, & Laughery, 1987).

Warning message readability is an important issue when designing and labeling

consumer products or for potentially unsafe environments. Regardless of the usefulness

of information contained in a warning message, that information will not be processed if

it is difficult to read or placed in a way that it is not easily noticeable by the consumer. For example, the font sizes and font styles may affect warning readability.

Helvetica, a sans serif typeface, is the standard for warning labels (Westinghouse, 1981; c.f. Silver & Braun, 1993) although other fonts, such as Century Schoolbook have been found to show greater reading speed among older adults (Vanderplas & Vanderplas, 1980). In addition to font weight (i.e., bold, italic, etc.), the font size must also be considered in warning design. The font size must be large enough for the average person to read and small enough to practically fit on a product label. In the case of warning signs, the font size must be noticeable from a certain distance. A negligible amount of research has been done on the appropriate font size for warning labels and even less so for posted warning signs. Silver and Braun (1993) examined the readability of fonts. Manipulating font types (Helvetica, Times, and Goudy), bold and roman weight of font, 10-point and 8-point font size, and a two-point and four-point signal word-text difference. Overall, Helvetica font was found to be more readable than either Times or Goudy and bold font was perceived more readable than roman type. The larger, 10-point type was found to be more readable than the smaller, 8-point type and readers rated a two-point signal word-text difference as easier to read than the larger difference of four points. A similar study by Silver, Kline, and Braun (1994) examined the perceived readability and perceived hazardousness of type form variables. In this case, Helvetica, Century Schoolbook, and Bookman fonts were used, the signal word-test size differences ranged from zero to 6 points, and the signal word size was varied among 14, 12, and 10 points. Century Schoolbook was found to be more readable than the other two fonts and the greater signal word size and lower signal word size-text differences were perceived as

more readable. All of the variables that were rated high in readability were also perceived as more hazardous, resulting in a statistically significant linear relationship between readability and perceived hazardousness.

Placement of signal words and messages in warnings.

The placement of a warning sign, posted warning, or other cautionary statement needs to be given some consideration. The placement of a warning on a product and the placement of a sign in a potentially unsafe environment depend on several environmental and user-related conditions in order to be effective. Facility or environmental sign locations should be such that environmental damage to the sign is minimal. With regard to labels on products, the general recommendation is that they be placed in a visible area immune from being covered by product spillage in the case of chemical products, or foreign substances (e.g., oil) in the case of machinery or hand-held equipment (Glassock & Dorris, 2006). Overtly placed warnings in product advertisements lead to not only higher warning label recall in consumers, but also to more favorable consumer responses to the brand resulting in favorable consumer purchase intentions (Torres, Sierra, & Heiser, 2007).

The combined research effort of the perceived hazard, color, text, and placement of warning messages and signal words provides some guidelines as to the effectiveness of warnings. The most effective warnings (i.e., readable and high in perceived hazard) are overtly placed, the signal word or words are usually printed in red or orange color, the type size is larger as opposed to smaller, and the message included in the warning provides enough information to effectively educate or raise the consumer's awareness.

In addition to the properties and characteristics of the warning itself, there are other variables that influence the readability and risk communication of a warning. These are usually issues associated with the end-user characteristics, the source of the warning (i.e., where the warning originates from), and the attention to and comprehension of the warning (Wogalter, 2006b).

Additional issues to consider in warning design.

In addition to the primary physical components of warnings, a warning will be effective in preventing a possibly dangerous behavior depending on variables such as the cognitive processing ability of the person viewing the warning, the user's perceived risk of a given product or situation, and behavioral compliance in terms of perceived relevance. Additionally, a limited number of studies have examined such variables as they relate to warning perception, evaluation, and design.

One of the limitations of warning signs concerns the processing of information and human ability to assess risk. That is, do people accurately estimate the risks they face? Because research indicates that people's perceptions of potential risk are often inaccurate, it follows that humans are faulty information processors and decision makers (Bettman, Payne, & Staelin, 1986). Additionally, research suggests that whether a certain type of risk is over-, under-, or correctly estimated depends on that risk's availability (i.e., how easily or quickly a person can recall occurrences of a certain risk). Estimating risk is usually erroneous because some risks, although statistically rare, are either over reported in the media or not reported enough (Kim, Ferrin & Rao, 2008). Individuals are also conditioned by their past experiences to believe whether a risk or a hazard is likely to happen and whether there is a possibility of it happening to them. Moreover, they

estimate the consequence of neglecting the warning, which includes the cost-benefit ratio of following the warning (Riley, 2006). This means that if heeding a warning involves extra effort on the part of the consumer (e.g., clearing the proper amount of space to use a particular piece of equipment) or heeding a warning requires extra cost (e.g., buying gloves to use a chemical product), chances increase that the consumer will not heed a warning. Past experiences which may include cognitive ability, maturity, and level of development are some of the factors that influence the heuristics that people apply to making choices about heeding warnings. For this reason, when designing warning signs targeted at adolescents who are potentially accessing adult content online (e.g., chat rooms, pornography, etc.), it is important to introduce the type of risk consequence that can occur from this action because the audience that these are presented to may not be sophisticated or educated enough to have knowledge of the consequential risk.

Suggested Warnings Guidelines for Prevention of Adult Content Access by Children

The above review of the warnings design literature and the current state and pattern of children's Internet use in combination with the lack of laws in existence today all point to the need for the development of a system of warnings that would target children who attempt to access adult content online. Because of various court rulings, targeting the adults who pose a threat has proved to be somewhat ineffective. Although it is not possible to develop such a system through one or two research projects, it is possible at this time to use the existing information to establish guidelines and recommendations for such a system as a base from which further research can begin.

Children and adolescents prefer to spend their online time browsing or using social networking sites, many of which allow the users to chat on the web page or in private,

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away from other users. This suggests that those sites should be targeted as potential

places where warnings may be used. In situations where a warning is necessary, but not

available, several steps are involved in the process of developing an appropriate warning.

First, the concepts to be conveyed must be outlined. Second, a determination must be

made as to the existence of appropriate warning images. If the latter are not available,

then possible existing images may be considered for modification to accommodate the

current need. Finally, if the situation is unique and requires a special set of warning

images, then these must be developed with input from either: a) the experts in the field

and/or b) the target audience (Wogalter, Silver, Leonard, & Zaikina, 2006). Because very

young children are not always an appropriate audience for input in warning design (for

communication difficulties and ethical reasons), these particular warnings must be

designed with input from such experts as developmental psychologists, graphic designers,

and cartoon artists. The warnings should feature pictorials that are easily understandable

and easily identifiable by children. Likewise, the pictorials or images used in the warning

should be innovative and scary enough to draw attention and prevent habituation from

children. As previous research indicated (e.g., Bzostek & Wogalter, 1999) the presence

of a pictorial, even a poorly designed one, is more effective in terms of capturing and

drawing attention to a warning than the absence of one. Beyond innovation and

noticeability, images used in such a warnings system should also be informative as to the

consequences of a particular action, such as chatting with strangers, sharing personal

information, or looking at pornographic material online. When the consequence of not

heeding a warning is presented; warnings are comprehended better and, therefore are

more effective (Silver, et al., 1995). This implies that whenever possible, the potential

consequence of not complying with a warning should be presented to inform and dissuade users from a website. A variety of colors, font types, and font sizes should be used because there is a paucity of online warnings research available to make concrete suggestions. However, because the colors red and orange have been shown to be consistently associated with higher perceived risk, warnings containing these colors should be used. Larger font sizes coupled with large message fonts have also been shown to be more effective in terms of noticeability and perceived hazard ratings.

The warning message is also an important component of a warning sign or label. Research shows that pictorials accompanied by explanatory text are rated higher in understandability, carefulness, likelihood of injury, severity of injury, and attention-getting qualities (McCafferty, 1999). In addition to being readable and understandable a warning must accomplish two primary goals: a) preventing the end-user from engaging in potentially dangerous activity and b) communicating the potential negative consequences. Braun, Holt, and Silver (1995) showed that when consequence information is added to product instructions, the perceived hazard of the product increased as compared to instructions that included an action or the warning only. For example, a product with a message that said, "To prevent eye injury and irritation, wear goggles or face shield" was rated higher in perceived hazard than a product that said, "Wear goggles or face shield" only. This suggests that a more informative warning message, especially one that presents consequences would be more effective than one that simply warns away from a situation without the explanation of potential threat or danger. Therefore, by applying the aforementioned concepts of warning design, it is feasible to design pop up warnings to be

used on adult content sites that would be effective in reducing children's risky and potentially harmful activity.

The Dilemma of Minors' Access to Adult Content: Two Issues

The inception and widespread use of the Internet has brought a considerable advance to every aspect of today's society from entertainment to communication. However, as with every technological advance, local and world governments are challenged as to the appropriate avenues of regulation. For example, in 1934, the US Congress enacted the first media regulation, the Communications Act. Along with the enactment of this act, the Federal Communications Commission was established, which was responsible for regulating 623 radio stations and a telephone industry with 14 million phones. However, the use of broadcast to the public by licensed radio stations started as early as 1919 with stations such as 9XM at the University of Wisconsin in Madison (Ford Reports, 2007). This means that little or no regulation of radio as a newly emerged media took place for approximately 15 years before the federal government was able to take regulatory action.

It can be argued that the Internet is currently in its early stages in terms of government regulation. Although the concept and a primitive network have been established as early as the 1960's, the United States and other world governments are slowly becoming aware of the possibilities, potential, and drawbacks of this new form of media. The public is looking to the government to regulate the Internet and offer safety in the new media with the potential for identity theft, credit card theft, and other negative circumstances (Goldman, 2003; Rasmussen Reports, 2008). Presently, the US federal government has moved forth regulations in the form of various acts that have been passed by the U.S. Congress (e.g., Communication Decency Act, Children's Internet Protection

Act, etc.). However, almost all of the laws that attempt to set up regulations for the type of content that minors are allowed to access on the Internet have been stricken down by the courts as unconstitutional because they violate First Amendment rights.

According to some reports (Lenhart & Madden, 2005, 2007), parents would like the government to set up more stringent laws for the type of content that is allowed in the media, including the Internet. Yet, the legislature's inability to circumvent local courts and the historically slow process of the legislative bodies creates an imperative for a system of warnings for minors. However, the creation of such a system poses a dilemma that must be resolved through repeated scientific (and legislative) inquiry. The dilemma of minors' access to adult content on the Internet consists of the possibility that the warnings themselves will serve to attract minors to harmful content as opposed to preventing them from accessing it.

Previous work on the effects of warning labels on attraction to television violence offers two conflicting theories of warnings that attempt to prevent the end-user from accessing unfavorable, illegal, or otherwise forbidden content. The tainted fruit theory predicts that warning labels will make the forbidden content less attractive to viewers or those who seek it (Christenson, 1992). The forbidden fruit theory, on the other hand, predicts that warnings specific to a certain content will make that content more attractive to end-users, therefore making the content more desirable (Bushman & Stack, 1996). The forbidden fruit theory encompasses the reactance (Brehm, 1966) theory. According to reactance theory when an individual's freedom to engage in certain behaviors is threatened, the individual will experience an unpleasant psychological state (reactance) that consists of the motivation to re-establish the freedom that has been threatened. The

more important the freedom is to the individual, the greater the degree of reactance when that freedom is threatened. One of the methods of re-establishing the threatened freedom is to engage in the prohibited behavior (Brehm, 1966; Wicklund, 1974).

Most pornography sites either do not present any warning about the content that they contain or give a set of somewhat prohibitive statements about the content with the option to enter or exit the site. This means that if a minor accidentally or purposefully accessed a website that contains adult content, they would either not be warned about the content or will see a warning that gives a set of one to seven statements about the conditions that must be satisfied for an individual to enter the website (e.g., "You must be over 18 years of age.") and two links "Enter" and "Exit". These take the end-user into the website's content and back to the previous page, respectively. However, this is not always the case. Some of the Nevada brothel websites do not take the end user to the previous webpage. For example, Dennis Hof's World Famous Bunny Ranch (http://www.bunnyranch.com/), a brothel in Carson City, Nevada website does not offer an option for the user to exit the site back to the previous page. Instead, when clicking the "Exit" link, the end-user is taken to a website for an adult entertainment nightclub featuring semi-nude photographs of females. Another brothel, the Shady Lady Ranch (http://www.shadyladyranch.com/) offers a message to users that reads, "This web site has adult content describing a legal brothel in the state of Nevada, U.S.A. It should be viewed by gentlemen that are at least 21 years of age. Are you 21 years of age?" Underneath this statement, a "Yes" and "No" links are provided. The "Yes" link takes the end-user to another page on the website, whereas the "No" link routs the user back to the page that they were using prior to the Shady Lady Ranch page. Although this particular website offers the end-users the option

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According the tainted fruit and forbidden fruit theories, these types of warnings will either detract or attract minors, respectively, from the content that is contained within the website. However, evidence exists that more explicit warnings that are specifically used to prohibit content may have an attraction effect. Specifically, examinations of warning labels about television violence revealed that participants were more likely to choose violent television content when the label indicated its presence and was not from a reputable source, but less likely to choose violent television content when the warning came from a reputable source such as the Surgeon General (Bushman & Stack, 1996). Conversely, Wurtzel and Surlin (1978) did not find that television warnings had a statistically significant influence on viewing choice. Moreover, in the case of brothel websites that were examined, most of the warning statements contained therein had a Flesch-Kincaid reading index of 6.9 or above. This means that a large portion of the population, those with a reading level below 7th grade, may not be able to correctly understand the warning statements presented on the websites.

Unfortunately, television content and advisory warnings are the only empirical research evidence that exists with a similarity to the Internet warnings proposed in the present studies. This type of a comparison poses statistically significant limitations for several reasons. First, television program ratings are not conventional warnings because they lack a number of components that a warning contains (i.e., warning message, signal word, etc.). Second, the few research efforts that have been conducted on the topic have little generalizability because they were self-report studies with little or no manipulation. Finally, the warnings proposed in the present studies are being applied to a content that is clearly illegal for the consumption by minors, as opposed to television advisories

cautioning that the content may be inappropriate, but not illegal. Therefore, the warnings that may be included in a system of warnings for minors must be prohibitive enough and sufficiently inform the end-user of possible consequence to be effective and serve as the forbidden versus the tainted fruit.

Specific Aims

The specific aim of the present studies was to conduct an exploratory investigation of icons that can be used or adapted for use on the Internet to prevent children from accessing adult content online.

Goals

1. An exploratory evaluation of icons that are aimed at children's Internet safety and

2. An examination of those icons rated highest in perceived understandability, likelihood of danger, and likelihood of avoiding websites given the combination with color, signal words, and warning messages.

CHAPTER 2

STUDY 1 METHODOLOGY AND RESULTS

Hypotheses

Hypothesis 1: Icons whose meaning is generally known will be higher in understandability than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher). For example, icon 14 ( ) will be rated higher in understandability than icon 16 ( ).

Hypothesis 1a: Icons whose meaning is generally known will be rated higher in carefulness than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

Hypothesis 1b: Icons whose meaning is generally known will be rated higher in likelihood of encountering danger than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

Hypothesis 1c: Icons whose meaning is generally known will be rated higher in severity of danger than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

Hypothesis 1d: Icons whose meaning is generally known will be rated higher in attention-getting than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

Hypothesis 1e: Icons whose meaning is generally known will be rated higher in likelihood of avoidance than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

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Hypothesis 1f: Icons whose meaning is generally known will be rated higher in familiarity than icons whose meaning is not known (i.e., those whose meaning is proposed by researcher).

Hypothesis 2: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in understandability than icons not commonly encountered in the environment. For example, icon 14 (⚠) will be rated higher in understandability than icon 12 (🐀)

Hypothesis 2a: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in carefulness than icons not commonly encountered in the environment.

Hypothesis 2b: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in likelihood of encountering danger than icons not commonly encountered in the environment.

Hypothesis 2c: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in severity of danger than icons not commonly encountered in the environment.

Hypothesis 2d: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in attention-getting than icons not commonly encountered in the environment.

Hypothesis 2e: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in likelihood of avoidance than icons not commonly encountered in the environment.

Hypothesis 2f: Familiar icons (i.e., those commonly seen in the environment) will be rated higher in familiarity than icons not commonly encountered in the environment.

Hypothesis 3: Concrete icons will be rated higher in understandability than abstract

icons. For example, icon 21 ( ) will be rated higher in understandability than icon

than icon 19 ( ).

Hypothesis 3a: Concrete icons will be rated higher in carefulness than abstract icons.

Hypothesis 3b: Concrete icons will be rated higher in likelihood of encountering

danger than abstract icons.

Hypothesis 3c: Concrete icons will be rated higher in severity of danger than abstract

icons.

Hypothesis 3d: Concrete icons will be rated higher in attention-getting than abstract

icons.

Hypothesis 3e: Concrete icons will be rated higher in likelihood of avoidance than

abstract icons.

Hypothesis 3f: Concrete icons will be rated higher in familiarity than abstract icons.

Hypothesis 4: Icons that feature clearly prohibitive images, such as police officers,

will be rated higher in understandability than those that feature more ambiguous

images. For example, icon 26 ( ) will be rated higher in perceived

dangerousness than icon 7

( ).

Hypothesis 4a: Icons that feature clearly prohibitive images will be rated higher in

carefulness than those that feature more ambiguous images.

Hypothesis 4b: Icons that feature clearly prohibitive images will be rated higher in

likelihood of encountering danger than those that feature more ambiguous images.

Hypothesis 4c: Icons that feature clearly prohibitive images will be rated higher in

severity of danger than those that feature more ambiguous images.

Hypothesis 4d: Icons that feature clearly prohibitive images will be rated higher in

attention-getting than those that feature more ambiguous images.

Hypothesis 4e: Icons that feature clearly prohibitive images will be rated higher in

likelihood of avoidance than those that feature more ambiguous images.

Hypothesis 4f: Icons that feature clearly prohibitive images will be rated higher in

familiarity than those that feature more ambiguous images.
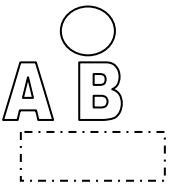
Abstract vs. Concrete Icons

Some hypotheses in the proposed study refer to concrete and abstract icons. Although

the definitions of concrete and abstract icons from the research literature were previously

given, there could still be ambiguity about which icons are concrete and which are

abstract. Therefore, it is necessary to apply a metric for classifying each of the proposed

icons into abstract and concrete categories. Garcìa, Badre, and Stasko (1994) developed

the metric that can be applied to icons to characterize their abstractness. The measure of

an icon is determined by adding up the icon's components in each icon and producing a

score. The components and their examples are shown in Table 1. The presence of each

of the components is scored as one point. The authors found that icons with less

components (up to 10) were perceived as more concrete and icons with a larger number

of components as more abstract. Icons shown in Appendix A have been rated based on

this metric with an abstractness score and an "abstract" or "concrete" classification.

Some icons, however, such as faces and bodies were not rated based on the metric

because they contain many components and the type of components contained are outside

the scope of the metric. These icons were rated as "abstract" and were not assigned a score.

Table 1

Components of icon abstractness metric based on Garcìa, Badre, and Stasko, 1994

Component	Component Example
Closed Figures	
Letters	
Open Figures (figure's outline is not continuous)	
Special Characters	
Horizontal Lines	
Vertical Lines	
Diagonal Lines	
Arrowheads	
Arcs	

Method

Thirty eight icons (see Appendix A) were tested in this study for their level of understandability, perceived hazard (carefulness), likelihood of encountering danger, severity of danger, noticeability (attention-getting), likelihood of avoidance, familiarity, and representativeness of meaning. The specific aim of Study 1 was to identify icons rated highest in understandability, perceived hazard (carefulness), and likelihood of

encountering danger; the highest rated icons were subsequently used in the second study, which examined the above mentioned properties of icons in pairing with signal words and warning messages. All participants in this study viewed all stimuli and responded to all questions.

Adult Participants

One hundred and ninety-four undergraduate students at the University of Nevada, Las Vegas participated in the study as partial fulfillment of the core requirements for general psychology. One hundred and ninety-nine participants accessed the study initially, however, data from five of the participants were not included in the analyses because they either did not complete any of the items or did not complete the study past the demographic items. No duplicate participation records were found. Of the one hundred ninety four participants whose data were analyzed, the mean age of the participants was 20.4 (SD = 4.24); 37.1% (N = 72) were male and 64.4% (N = 121) were female, and one participant did not specify their sex. African American participants constituted 8.2% (N = 16) of the sample, Asian American / Pacific Islander 23.2% (N = 45), Caucasian 49% (N = 95), Hispanic / Latino(a) 12.4% (N = 24), Multiracial 4.6% (N = 9), Native American .5% (N = 1), and 2.1% (N= 4) indicated "Other" as their race / ethnicity category. The majority of participants (76.8%, N = 149) spoke English as the primary family language while growing up, 8.8% (N = 17) spoke a language other than English, and the remaining 14.4% (N = 28) spoke both English and another language in the home. With regard to marital / relationship status, 3.1% (N = 9) of the participants were married, 19.6% (N = 38) were partnered in a committed relationship, 73.7% (N = 143) were single, 2.1% (N = 4) were divorced, and the remaining 1.5% (N = 3) declined to state

their relationship status. The large majority of the participants reported that they had

siblings (91.2%, N = 177). Only nine of the participants (4.6%) reported that they had

children. Three quarters of the participants (75.6%, N = 146) reported that they use the

Internet multiple time per day (more than twice), 22.3% (N = 43) reported that they use

the Internet twice a day, and 2.1% (N = 4) of the participants reported that they use the

Internet once or twice a week. On average, participants reported using the Internet

approximately 11.79 hours per week (*SD* = 12.75).

Minor Participants

Eleven minor participants 2 males and 9 females were recruited through friends of the

researcher. Participation in the study was not mandatory and the minor participants read

and signed an assent form prior to participation. In addition, a parental consent form was

completed by the minor participants' parent or guardian.

The average age of the minors was 13.27 (*SD* = 2.24, with a range from 12 to 17).

Nine participants were Caucasian (81.8%), one was Hispanic (9.1%), and one (9.1%) was

biracial (Hispanic and Caucasian). The majority of the minors spoke English as the

primary language at home (N = 10) and one of the minors spoke both English and another

language as the primary languages. The majority of minors reported that they used the

Internet either once or twice per day (45%) or multiple times per day (45%) with only

one participant (10%) reporting using the Internet on average once or twice per week.

Materials

Thirty eight images, 400 x 400 megapixels (5.56" x 5.56") in size, placed in the

middle of the screen in the color that they appear in Appendix A, on a white screen

background were shown to participants[2]. Twenty eight of the images are not copyrighted and have been obtained from free clip art websites, Microsoft Word or other free sources. The rest of the images have been created using Adobe Creative Suite 2. One of the images, protected by copyright, is used with the expressed written permission of the copyright holder. For a detailed explanation of each of the image's sources, refer to Appendix A.

Procedure: Adult Participants

Participants accessed the study through the UNLV Department of Psychology Experimetrix website. The entire study was administered via the Internet. Upon accessing the study, participants were asked to read the informed consent form (Appendix B). The study was programmed to ensure that a response to the informed consent form was mandatory and the participants could not progress through the study without first entering a response of either "Accept and Proceed to Survey" or "Exit Survey". The "Exit Survey" option took participants to an exit screen with a message thanking them for participating in the study; the "Accept and Proceed to Survey" option took the participants through the rest of the survey. No other items in the study were mandatory and participants were free to leave any questions unanswered.

Participants first filled out a demographic information questionnaire which included their age, gender, race/ethnicity, first language, marital status, number and ages of children (if any), number and ages of younger siblings (if any), and an estimation of number of hours per day that they spend using the Internet (see Appendix B for the complete questionnaire).

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[2] Some of the icons were more than 400 megapixels horizontally. In that case, the vertical dimension of the icons was adjusted accordingly.

After completing the demographic questions, participants rated the thirty-eight icons. Icons were presented to participants in a random order, one at a time, using a randomized schedule created by the program RANPER. Three randomized schedules were used to present icons. Participants answered the following questions about each icon:

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

2. How understandable is this icon to you?

0	1	2	3	4	5	6	7	8
Not at all understandable		Somewhat understandable		Under- standable		Very Understandable		Extremely understandable

3. How understandable do you think this icon is to young children (ages 3 to 11 years old)?

0	1	2	3	4	5	6	7	8
Not at all understandable		Somewhat understandable		Under- standable		Very Understandable		Extremely understandable

4. How understandable do you think this icon is to adolescents (ages 12 to 17 years old)?

0	1	2	3	4	5	6	7	8
Not at all understandable		Somewhat understandable		Under- standable		Very Understandable		Extremely understandable

5. How careful would you be after seeing this icon?

0	1	2	3	4	5	6	7	8
Not at all careful		Somewhat careful		Careful		Very Careful		Extremely careful

6. What is the likelihood of encountering danger implied by this icon?

0	1	2	3	4	5	6	7	8
Not at all likely		Somewhat likely		Likely		Very likely		Extremely likely

7. What is the severity of danger implied by this icon?

0	1	2	3	4	5	6	7	8
Not at all severe		Somewhat severe		Severe		Very severe		Extremely severe

8. How attention-getting is this icon?

0	1	2	3	4	5	6	7	8
Not at all attention-getting		Somewhat attention-getting		Attention-getting		Very attention-getting		Extremely attention-getting

9. If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?

0	1	2	3	4	5	6	7	8
Not at all likely		Somewhat likely		Likely		Very likely		Extremely likely

10. How familiar are you with this icon?

0	1	2	3	4	5	6	7	8
Not at all familiar		Somewhat familiar		Familiar		Very familiar		Extremely familiar

11. How representative is this icon of the following definition: "_____"?

0	1	2	3	4	5	6	7	8
Not at all representative		Somewhat representative		Representative		Very representative		Extremely representative

Icons were presented in succession for each question and the next question was presented after all icons had been viewed in pairing with the specific question to avoid carry-over effects (see Figure 3 for example screens).

Procedure: Minor Participants

All minor participants were met by the researcher at a location at UNLV. The researcher used a personal laptop to access the study via the Internet. Each minor participant was accompanied by an adult parent or guardian. Prior to accessing the study, the parent or guardian read and signed the consent form (see Appendix C). Concurrently, the researcher read the child assent form to the minor participants and explained the purpose of the study and the consent process. The minor participants likewise signed the assent form. The minor participants proceeded to access the study. They first filled out

the same demographic information as the adult participants (the question about whether they have children was omitted). The rest of the procedure included the rating of the thirty-eight icons. However, for the purposes of shortening their participation time, only two questions "How understandable is this icon to you?" and "If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?" were included.
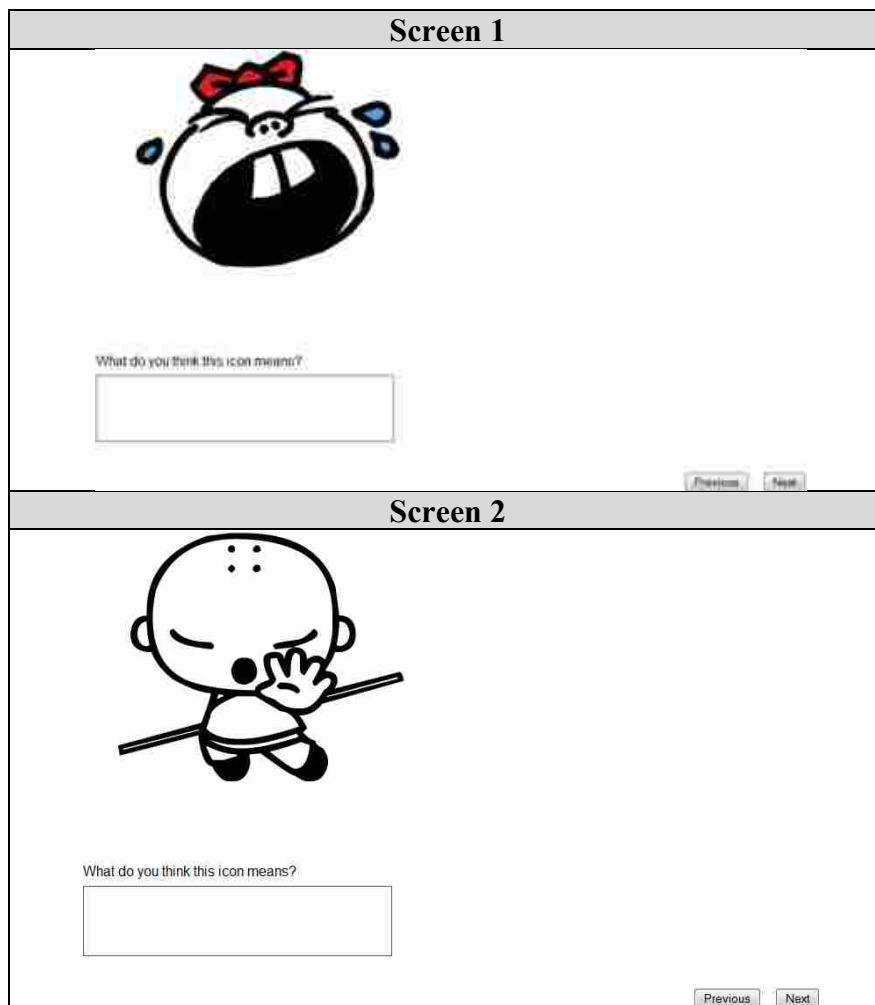
Figure 3. *Example screens for each icon (images and text are not pictured to scale).*

Results - Adults

Data Analysis for Hypothesis Testing

Four one-way multivariate analyses of variance (MANOVAs) were performed using the understandability composite, carefulness, likelihood of encountering danger, severity of danger, attention getting, and likelihood of avoidance as dependent measures and meaning, familiarity, abstractness, and prohibitiveness as independent variables. The understandability composite score was used because of high correlations among the understandability items (Questions 2, 3, and 4) and similar patterns of correlations among other variables. Correlations among items and average correlations are reported in Table 15. To determine which of the dependent variables contributed to differences in levels of independent variables, follow-up univariate analyses of variance (ANOVAs) were conducted. Due to a large number of group comparisons, Bonferroni corrections for probability ($\alpha = .0083$) were applied. The sample used in the analyses consisted of thirty eight ($N = 38$) icons and mean dependent variable scores produced by participants were used as dependent measures. Because of the small sample size, assumptions for MANOVA were carefully examined to determine if they were reasonable for the data. Skewness measures for each variable cell was not extreme, mostly smaller than |1| with the largest value of -1.84. Data were screened for univariate outliers with the Descriptives and Explore functions in SPSS. No univariate outliers were found. Multivariate outliers were screened by computing Mahalanobis distance ($\chi^2_{(6)} = 12.59$, $\alpha =.05$). Outliers were found and removed prior to proceeding with the analyses.

Hypotheses Results

The means and standard deviations for all questions answered by adult participants are reported in Tables 4 through 11. The means and standard deviations for both questions answered my minor participants are reported in Table 13.

Hypothesis 1 through 1f.

The first set of hypotheses were examined via a one-way within-subjects MANOVA with meaning (meaning known vs. meaning unknown) serving as the independent variable and understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity used as the dependent measures. One outlier (icon 1) was found and removed prior to analyses. Box's M test for equality of variance-covariance matrices was statistically significant, indicating that this assumption was not met, $F(28, 790.05) = 1.91, p < .01$. No statistically significant difference was found between icons whose meaning is known and icons whose meaning is not known, $F(6, 31) = .016, p > .05, \eta^2 = .339$, Wilks' $\Lambda = .622$ on the combined scores of understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity.

Hypothesis 2 through 2f.

The second set of hypotheses were examined via a one-way MANOVA with familiarity (familiar vs. unfamiliar) serving as the independent variable and understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity used as the dependent measures. Two outliers (icon 1 and icon 11) were identified and removed prior to analyses. Box's M test for equality of variance-covariance matrices was statistically

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significant, indicating that this assumption was not met, $F(28, 2201.46) = 2.12$, $p < .01$.

A statistically significant difference between familiar and unfamiliar icons was found on the combined scores of understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity, $F(6, 29) = 8.94$, $p < .001$, Wilks' $\Lambda = .359$ with a strong association between familiarity and dependent measures scores, $\eta^2 = .727$. Follow up univariate analyses (Bonferroni $\alpha = .0083$) indicated that there were statistically significant differences between familiar and unfamiliar icons for all but one (likelihood of avoidance) dependent measures. Familiar icons were rated higher than unfamiliar icons in understandability, $F(1, 34) = 9.55$, $p < .01$, $\eta^2 = .219$; carefulness, $F(1, 34) = 26.49$, $p < .0001$, $\eta^2 = .438$; likelihood of encountering danger, $F(1, 34) = 21.07$, $p < .0001$, $\eta^2 = .383$; severity of danger, $F(1, 34) = 18.45$, $p < .0001$, $\eta^2 = .352$; attention getting, $F(1, 34) = 8.23$, $p < .01$, $\eta^2 = .195$; and familiarity, $F(1, 34) = 29.03$, $p < .01$, $\eta^2 = .461$.

Hypothesis 3 through 3f.

The third set of hypotheses were examined via a one-way MANOVA with abstractness (abstract vs. concrete) serving as the independent variable and understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity used as the dependent measures. Outliers (icons 1 and 11) were found and removed prior to analyses.

A statistically significant difference was found between abstract and concrete icons on the combined scores of understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity, $F(6, 30) = 2.44$, $p < .05$, Wilks' $\Lambda = .672$ with a strong association between abstractness

and dependent measures scores, $\eta^2 = .972$. Follow up univariate analyses indicated that abstract icons were statistically significantly higher on both the likelihood of encountering danger, $F(1, 36) = 12.19$, $p < .001$, $\eta^2 = .253$ and severity of danger, $F(1, 36) = 12.24$, $p < .001$, $\eta^2 = .254$. No statistically significant differences were found between abstract and concrete icons on understandability, carefulness, likelihood of avoidance, attention-getting, and familiarity, all $ps > .05$.

Hypothesis 4 through 4f.

The fourth and final set of hypotheses were examined via a one-way MANOVA with prohibitiveness (prohibitive vs. non-prohibitive) serving as the independent variable and understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity used as the dependent measures. No outliers were found in the data. Box's M test for equality of variance-covariance matrices was statistically significant, indicating that this assumption was not met, $F(28, 4403.41) = 1.65$, $p < .05$. A statistically significant difference was found between prohibitive and non-prohibitive icons on the combined scores of understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity, $F(6, 31) = 3.32$, $p < .05$, Wilks' $\Lambda = .609$ with a moderate association between prohibitiveness and dependent measures scores, $\eta^2 = .400$. Follow-up univariate tests (Bonferroni $\alpha = .0083$) indicated that prohibitive icons were scored higher in understandability, $F(1, 36) = 13.40$, $p < .001$, $\eta^2 = .271$; carefulness, $F(1, 36) = 10.86$, $p < .002$, $\eta^2 = .232$; likelihood of avoidance, $F(1, 36) = 10.29$, $p < .003$, $\eta^2 = .222$; and familiarity, $F(1, 36) = 13.59$, $p < .001$, $\eta^2 = .274$. Differences between prohibitive and non-prohibitive icons with prohibitive icons scored

higher than non-prohibitive icons closely approached significance in attention getting, $F(1, 36) = 7.66$, $p = .009$, $\eta^2 = .175$ and were not statistically significantly different in likelihood and severity of danger, and attention-getting, $ps > .05$.

Results – Children

Hypotheses

Analyses performed on the children's data were guided by the hypotheses that were constructed for the adults and were the same as those preformed on the adult data. For the dependent variables, only the understandability and likelihood of avoidance measures were used, since those were the only variables on which data was collected from children.

Hypothesis 1.

This hypothesis was examined via a one-way MANOVA with meaning (meaning known vs. meaning unknown) used as the independent variable and understandability and the likelihood of avoidance scores used as the dependent measures. No outliers were found prior to analyses. A statistically significant difference between icons whose meaning is known and those whose meaning is unknown was found on the combined scores of understandability and likelihood of avoidance, Wilks' $\Lambda = .881$, $F(2, 35) = 4.07$, $p < .05$, $\eta^2 = .189$. Follow up univariate analyses (Bonferroni $\alpha = .025$) indicated that there were no statistically significant differences between icons whose meaning is known and those whose meaning is not known in understandability, $p > .05$. However, icons whose meaning is not known ($M = 5.64$, $SD = 1.45$) were found to be rated statistically significantly higher than those whose meaning is not known ($M = 5.64$, $SD = 1.45$) on likelihood of avoidance, $F(1, 36) = 7.68$, $p < .01$, $\eta^2 = .176$.

Hypothesis 2.

A statistically significant difference between familiar and unfamiliar icons were found on the combined scores of understandability and likelihood of avoidance, Wilks' Λ = .781, $F(2, 35) = 4.07$, $p < .05$, $\eta^2 = .219$. Follow up univariate analyses (Bonferroni α = .025) indicated that familiar icons ($M = 7.02$, $SD = .918$) were scored statistically significantly higher in understandability than unfamiliar icons ($M = 5.85$, $SD = 1.65$), $F(1, 36) = 5.77$, $p < .025$, $\eta^2 = .138$. Familiar icons ($M = 5.45$, $SD = 1.17$) were also scored higher in likelihood of avoidance than unfamiliar icons ($M = 4.11$, $SD = 1.36$), $F(1, 36) = 8.98$, $p < .01$, $\eta^2 = .200$.

Hypothesis 3.

A statistically significant difference between abstract and concrete icons was found on the combined scores of understandability and likelihood of avoidance, Wilks' Λ = .744, $F(2, 35) = 6.03$, $p < .001$, $\eta^2 = .256$. Follow up univariate analyses (Bonferroni α = .025) indicated that abstract icons did not differ statistically significantly from concrete icons on understandability, $F(1, 36) = .829$, $p > .05$, $\eta^2 = .023$, however, abstract icons (M = 4.27, SD = 1.32) were scored statistically significantly lower in likelihood of avoidance than concrete icons($M = 6.14$, $SD = .950$), $F(1, 36) = 10.86$, $p < .01$, $\eta^2 = .232$.

Hypothesis 4.

A statistically significant difference between prohibitive and non-prohibitive icons was found on the combined scores of understandability and likelihood of avoidance, Wilks' Λ = .493, $F(2, 35) = 17.99$, $p < .0001$, $\eta^2 = .507$. Follow up univariate analyses (Bonferroni α = .025) indicated that prohibitive icons ($M = 7.25$, $SD = 1.00$) were scored statistically significantly higher than non-prohibitive icons ($M = 5.34$, $SD = 1.33$) on

understandability, $F(1, 36) = 24.21$, $p < .0001$, $\eta^2 = .402$. Likewise, prohibitive icons (M = 5.51, SD = 1.09) were scored statistically significantly higher than non-prohibitive icons (M = 3.72, SD = 1.66), $F(1, 36) = 23.78$, $p < .0001$, $\eta^2 = .398$.

Icon Selection for Study 2

Icons for use in the second study were selected following a multi-step procedure (Figure 4 shows an outline of the steps and criteria used for icon selection). The first criterion used for selection were the responses to Question 1 "What does this icon mean?". Qualitative responses were coded for agreement with the known or proposed meaning of each icon. A score of "0" indicated an incorrect response (i.e., a response that was not similar to the meaning of the icon) and a score of "1" indicated a correct response (i.e., a response that was similar to the meaning of the icon. For example, for

icon 26 ( ), the proposed meaning was "Caution / Stop". A response of "policeman directing traffic" was coded as "0" and a response of "caution or be careful" was coded as "1". It was determined that icons with an average agreement of eighty-five percent or higher with the icon's meaning would be selected for further evaluation. Both average agreement percentages and 95% confidence intervals were considered. Of the thirty-eight icons used in the study, five icons #s 1 (Cry Baby), 9 (Prohibit), 18 (Boy), 21 (Thumb Down), and 34 (No Children Under 18) were selected for the second step of evaluation.

The second criterion consisted of choosing icons with highest understandability scores among the five that were chosen in the previous step. In order to be selected for further evaluation, an icon's understandability rating had to be 4.5 or higher. Due to high correlations among the three understandability items (items 2, 3, and 4), an

understandability composite score was created by computing the average of the three understandability items for each icon and used for this criterion. Of the five icons chosen in the previous step, all five had an understandability composite average of above 4.5 (see Table 4 for understandability composite means).

The third criterion consisted of choosing icons with highest carefulness rating out of the five icons selected in step two. Similar to understandability, an icon had to have a carefulness score of 4.5 or higher in order to be selected for further evaluation. All five icons had carefulness means higher than 4.5.

The fourth step in the selection process consisted of examining the dangerousness means for the five icons selected in the previous step. Two questions (questions 6 and 7) examined the dangerousness of the icons. Question 6 asked about the likelihood of danger and question 7 asked about the severity of danger. High correlations were found between these two questions (see Table 4), therefore, a composite dangerousness score was created and used for selection criterion. Similar to the previous steps in order to be considered, an icon had to have a mean of at least a 4.5 on the dangerousness composite score in order to be considered for further evaluation. Icons 9, 18, 21, and 34 had dangerousness composite means higher than 4.5. However, the mean dangerousness score for icon 1 was 2.86. At this time, it was decided to include icon 1 in further evaluation and look at the remaining to criteria for selection before excluding icon 1 from Study 2.

The fifth step in the selection process included examination of the attention-getting means for the five icons. In order to be considered further each icon had to have a mean

ALL ICONS in Study 1
(N = 38)

Agreement with icon's meaning lower
than 85% (including CI)

Agreement with icon's meaning 85%
or higher (including CI)

ICONS with 85% or
higher agreement ratings
(N = 5)

Understandability composite
mean lower than 4.5

Icons **NOT** Used
in Study 2

Understandability composite
mean 4.5 or above

ICONS with understandability
composite mean of 4.5 or above
(N = 5)

Carefulness mean < 4.5

Carefulness score ≥ 4.5

ICONS with carefulness
mean ≥ 4.5 (N = 5)

Dangerousness mean < 4

Dangerousness mean ≥ 4.5 (N = 5)

ICONS with dangerousness
composite mean ≥ 4.5 (N = 5)

Attention-getting mean < 4.5

Attention-getting mean ≥ 4.5

ICONS with attention-getting mean
of ≥ 4.5 (N = 5)

Likelihood of avoidance
mean < 4.5

Likelihood of avoidance
mean ≥ 4.5

ICONS to be used in
STUDY 2 (N = 5)

Figure 4. Study 2 proposed inclusion selection process for icons tested in Study 1.

of 4.5 or above. All five icons selected in the previous step had a mean of 5.0 or above

with the exception of icon 21 ($M = 4.99$), which was still above the required cut-off.

The final criterion for icon selection included the examination of the likelihood of

avoidance scores (Question 9). In order to be selected for inclusion in Study 2, icons had

to have a mean of 4.5 or above on the likelihood of avoidance question. All five icons

had likelihood of avoidance means higher than 4.5. At this time, it was determined that

all five icons initially selected in the first step of the icon selection process will be

included in the second study. The icons chosen for Study 2 are shown in Figure 5.

a.   b.   c.   d.   e.
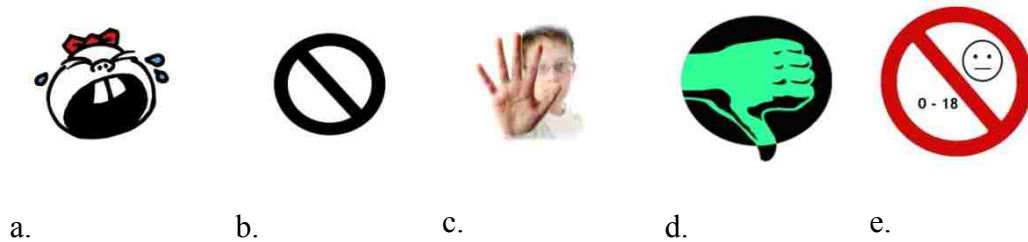
(a) Crying Baby icon (meaning: danger); (b) Prohibit icon (meaning: stop, no);
(c) Boy icon (meaning: stop, no); (d) Thumb Down icon (meaning: no); (e) No
Children Under 18 icon (meaning: no children under 18)
Figure 5. Icons chosen for use in Study 2.

CHAPTER 3

STUDY 2 METHODOLOGY AND RESULTS

Hypotheses

Due to the exploratory nature of the icons that were tested in Study 1 and because it was not initially known which of the icons were going to be included in Study 2, no hypotheses were made pertaining to specific icons. However, based on previous research efforts in the area of warning messages and signal words the following general hypotheses were made.

Hypothesis 1: Warnings with the signal word STOP will be rated higher in likelihood and severity of danger and amount of carefulness than warnings with the word WARNING or no signal word.

Hypothesis 2: Warnings with the most informative message ("This is illegal. Your IP address may be recorded and police may be notified") will be rated higher in likelihood and severity of danger and amount of carefulness than warnings with other messages.

Hypothesis 3: Warnings with a red signal word will be more attention-getting than warnings presented in black.

Study Variables and Analyses Used in the Study

Five icons from Study 1 chosen according to the criteria described above were included in the second study. This second study utilized a mixed-model factorial design to test the overall effectiveness[3] of the icons in combination with color (red and black), signal words (control condition, where no signal word was included, STOP, and

_____

[3] Effectiveness is the linear combination of understandability, carefulness, likelihood of danger, attention-getting, and avoidance.

WARNING), warning messages (Control condition, message 1, message 2, and message 3), gender (for adults only), and age of the participants (for adults' and minors' combined data. Six separate analyses were performed. The adults' data were analyzed using a mixed-model sex x icon x color x signal word x warning message and sex x icon x signal word x warning message MANOVAs (the control conditions were excluded from the former analysis and included in the latter) with understandability, carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance serving as dependent variables. The combined data for the adults and children were analyzed using a mixed-model age x icon x color x signal word x warning message and age x icon x signal word x warning message profile analyses (the control conditions were excluded from the former analysis and included in the latter) with understandability and likelihood of avoidance serving as dependent variables.. Finally, the children's data were analyzed using a repeated measures within subjects icon x color x signal word x warning message and icon x signal word x warning message MANOVAs (the control conditions were excluded from the former analysis and included in the latter) with understandability and likelihood of avoidance serving as dependent variables.

The mixed-model multivariate design in this study included four within-subject variables (icon, signal word color, signal word, and warning message) and one between subjects variable (gender) with multiple dependent measures (understandability, carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance. There were five icons in the icon variable. The color variable refers to the color of the signal word and included three levels, control (no color), red, and black. The background color of the icon was not varied and remained white for all icons. The signal

word variable included three levels, no signal word (control), the word STOP (high

perceived hazard), and the word WARNING (moderate perceived hazard). These words

were chosen based on their level of perceived hazard as found by Silver, Tubilleja, and

Ferrante (1995) and Wogalter and Silver (1995).

Table 2

Flesch-Kincaid reading indexes for proposed warning messages reading ease[4] and grade level ratings.

Message Number	Warning Message	Flesch Reading Ease	Flesch-Kincaid Grade Level
1.	This is illegal.	62.7	5.2
2.	This is illegal. Your IP address may be monitored.	70.6	4.5
3.	This is illegal. Your IP address may be monitored and police may be called.	78.8	3.9

The four warning message conditions varied in severity of consequence that each

message will introduce to the end-user. The message conditions were no warning

message (control), "This is illegal" (warning message condition 1), "This is illegal. Your

IP address may be monitored." (warning message condition 2), and "This is illegal. Your

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[4] This score like the Flesch-Kincaid grade level score is based on word and sentence length, but utilizes different weights in the score measurement. Higher scores on the Flesch Reading Ease rating indicate material that is easier to read; lower numbers indicate passages or sentences that that are more difficult to read.

IP address may be monitored and the police may be notified." (warning message condition 3). All warning messages have been tested with the Flesch-Kincaid readability index (Flesch, 1948) for their prospective grade level.

Method

Adult Participants

Three hundred and fifty three undergraduate students at the University of Nevada, Las Vegas participated in the study as partial fulfillment of the course requirements for general psychology. Three hundred and seventy eight participants accessed the study initially, however, data from twenty-five of the participants were not included in the analyses because they either did not complete any of the items or did not complete the study past the demographic items. No duplicate participation records were found. Of the three hundred and fifty three participants whose data were analyzed, the mean age of the participants was 20.06 (SD = 3.46); 30.3% (N = 107) were male and 69.1% (N = 244) were female, and two of the participants did not specify their sex. African-American participants constituted 8.8% (N = 31) of the sample, Asian American / Pacific Islander 29.2% (N = 103), Caucasian 40.5% (N = 143), Hispanic / Latino(a) 17.6% (N = 62), Multiracial 2.0% (N = 7), Native American .8% (N = 3), .8% (N= 3) indicated "Other" as their race / ethnicity category, and one person did not report their race. More than half of the participants (69.1%, N = 244) spoke English as the primary family language while growing up, 11.6% (N = 41) spoke a language other than English, and the remaining 19.3% (N = 68) spoke both English and another language in the home. With regard to marital / relationship status, 5.7% (N = 20) of the participants were married, 19.6% (N = 69) were partnered in a committed relationship, 72.4% (N = 255) were single, 1.7% (N =

6) were divorced or separated, .6% (N = 2) declined to state their relationship status, and one participant did not indicate a response. The large majority of the participants reported that they had siblings (87.3%, N = 308). Twenty one participants (6%) reported that they had children. More than three quarters of the participants (80.5%, N = 284) reported that they use the Internet multiple time per day (more than twice), 17.8% (N = 63) reported that they use the Internet twice a day, and 1.7% (N = 6) of the participants reported that they use the Internet once or twice a week. On average, participants reported using the Internet approximately 12.5 hours per week (*SD* = 14.0).

Minor Participants

Ten minor participants, five males and five females with a mean age of 14 (*SD* = 2.11, range 11 to 16) were a sample of convenience and were recruited through friends of the researcher. Participation in the study was not mandatory and the minor participants read and signed an assent form prior to participation. In addition a parental consent form that was completed by the minor participants' parent or guardian.

Six participants were Caucasian (60.0%), one was Hispanic (10.0%), and three were biracial (Hispanic and Caucasian) (30.0%). Half of the minors spoke English as the primary language at home (N = 5), three one of the minors spoke a language other than English in the home, and one of the minors spoke both English and another language as the primary languages. Four of the minors reported that they used the Internet multiple times per day, two reported that they used the Internet either once or twice per day, three reported that they used the Internet once or twice per week, and one reported that they used the Internet once or twice a month. The mean hours per month estimated by the minors that they used the Internet was 6.63.

Materials

One hundred images approximately 600 x 600 megapixels (6.25" x 6.25") in size, placed in the middle of the screen on a white screen background, were shown to participants. The images were created using Adobe Creative Suite 2 software and contained all possible combinations of icons, signal word color, signal word, and warning message.

Procedure: Adult Participants

Participants accessed the study through the UNLV Department of Psychology Experimetrix website. The entire study was administered via the Internet. Upon accessing the study, participants were asked to read the informed consent form (Appendix B). The study was programmed to ensure that a response to the informed consent form was mandatory and the participants could not progress through the study without first entering a response of either "Accept and Proceed to Survey" or "Exit Survey". The "Exit Survey" option took participants to an exit screen with a message thanking them for participating in the study; the "Accept and Proceed to Survey" option took the participants through the rest of the survey. No other items in the study were mandatory and participants were free to leave any questions unanswered.

Participants first filled out a demographic information questionnaire which included their age, gender, race/ethnicity, first language, marital status, number and ages of children (if any), number and ages of younger siblings (if any), and an estimation of number of hours per day that they spend using the Internet (see Appendix B for the complete questionnaire).

After completing the demographic questions, participants were asked to look at an Ishihara Test for Colorblindness image. The image was of a number 56 consisting of red circles surrounded by a background of green circles. The participants were asked to type in the number that they see on the image into an open field. The question was programmed in such a way as to exclude participants who typed a number other than 56 by routing them to an exit screen with a message thanking them for participating in the study, whereas those who typed the correct number were routed on through the rest of the study. After viewing the colorblindness image, participants viewed the one hundred warning images used in the study. Icons were presented to participants in a random order one at a time using a randomized schedule created by the program RANPER. A different randomized order was used for each question. Participants answered the following questions about each warning image:

1. How understandable is this icon to you?

0	1	2	3	4	5	6	7	8
Not at all understandable		Somewhat understandable		Under- standable		Very Understandable		Extremely understandable

2. How careful would you be after seeing this icon?

0	1	2	3	4	5	6	7	8
Not at all careful		Somewhat careful		Careful		Very Careful		Extremely careful

3. What is the likelihood of encountering danger implied by this icon?

0	1	2	3	4	5	6	7	8
Not at all likely		Somewhat likely		Likely		Very likely		Extremely likely

4. How attention-getting is this icon?

0	1	2	3	4	5	6	7	8
Not at all attention-		Somewhat attention-		Attention- getting		Very attention- getting		Extremely attention-

getting   getting   getting

5. If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?

0	1	2	3	4	5	6	7	8
Not at all likely		Somewhat likely		Likely		Very likely		Extremely likely

Warning images were presented in succession for each question and the next question was presented after all icons had been viewed in pairing with the specific question to avoid carry-over effects, similar to the procedure in Study 1.

Procedure: Minor Participants

The procedure for minor participants was identical to the procedure used in Study 1 with one exception. Similar to the adult participants in this study, minors were also asked to look at an Ishihara Test for Colorblindness image. The same image as was used with the adults was used with minor participants and the same exclusion criteria were applied to minor participants.

<div align="center">

Results – Study 2

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Data Analysis for Hypothesis Testing – Adult Data

Two repeated measures mixed-model multivariate analyses of variance (MANOVAs) were performed using understandability, carefulness, likelihood of encountering danger, attention getting, and likelihood of avoidance as dependent measures and icon, signal word color, signal word, and warning message as repeated measures to test the adult data. Sex was used as a between-subjects variable. To determine which of the dependent variables contributed to differences in levels of independent variables, follow-up univariate analyses of variance (ANOVAs) were conducted. Due to a large number of group comparisons, Bonferroni corrections for probability ($\alpha = .01$ for the first two

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analyses and α = .025 for the profile analyses) were applied. The sample used in the

analyses consisted of three hundred fifty three adult participants (N = 353) and ten (N =

10) minor participants. Assumptions for MANOVA were examined to determine if they

were reasonable for the data. Skewness measures for each variable cell were not

extreme, mostly smaller than |1| with the largest value of -1.38. Data were screened for

univariate outliers with the Descriptives and Explore functions in SPSS. No univariate

outliers were found. Multivariate outliers were screened by computing Mahalanobis

distance. Mahalanobis distances were computing using the chi squared criterion of $\chi^2_{(5)} =$

11.07. Twenty outliers were found and removed prior to proceeding with the analyses.

No colorblind participants were found among the adults.

Collinearity.

Due to high correlations among similar items (i.e., understandability items,

dangerousness items) and similar patterns of correlations across items (see Table 12), the

dependent measures were combined into fewer items. The average correlations for

understandability were .477 for items 2 ("How understandable is this icon to you?") and

3 ("How understandable do you think this icon is to young children (ages 3 to 11 years

old)?); .607 for items 2 and 4 (How understandable do you think this icon s to

adolescents (ages 12 to 17 years old)?); and .502 for items 3 and 4. For dangerousness

questions, items 6 "What is the likelihood of danger implied by this icon?" and item 7,

"What is the severity of danger implied by this icon?", the average correlation was .692.

Average correlations were computed using the program AVCOR.

Inter-item correlations in Table 12 were tested for significance using the Benjamini-

Hochberg procedure for controlling false discovery rate, which is the expected proportion

of false positives among all statistically significant hypotheses. When testing multiple univariate correlations in a matrix, Type I error rate may compound. Many of the proposed corrections (e.g., multistage Bonferroni) fail to control Type I error rate. Benjamini and Hochberg (1995) proposed controlling false discovery rate instead of Type I error rate. This method has been advocated by the American Educational Research Association (AERA) for their journals. Therefore this procedure was used when determining statistical significance for the individual correlations in matrices in Tables 12 and 15.

Repeated Measures MANOVA – Control Condition Excluded – Adults

For the first MANOVA, the control condition data were excluded and for the second MANOVA, the control condition data were analyzed, but the data were collapsed across signal word color.

The main effect for sex was not found to be statistically significant, $F(5, 123) = .585$, $p > .05$, Wilks' $\Lambda = .977$. Likewise, all interactions involving the sex variable (i.e., sex x icon, sex x color, sex x signal word, sex x warning message, icon x color x sex, icon x signal word x sex, color x signal word x sex, icon x color x signal word x sex, icon x warning message x sex, color x warning message x sex, icon x color x warning message x sex, signal word x warning message x sex, icon x signal word x warning message x sex, color x signal word x warning message x sex or icon x color by signal word x warning message) were not statistically significant; all ps $> .05$. Because the sex variable was not statistically significant, the repeated measures MANOVA was performed again without the sex (between variable), as an all within analysis to increase the power of the computation.

Main effects.

A statistically significant main effect was found for icon, $F(20, 111) = 12.08$, $p <$ .0001, $\eta^2 = .685$, Wilks' $\Lambda = .315$, color, $F(5, 126) = 21.14$, $p < .0001$, $\eta^2 = .456$, Wilks' $\Lambda = .544$, signal word, $F(5, 126) = 11.52$, $p < .0001$, $\eta^2 = .314$, Wilks' $\Lambda = .686$, and warning message, $F(10, 121) = 38.00$, $p < .0001$, $\eta^2 = .758$, Wilks' $\Lambda = .242$.

Subsequent univariate analyses (Bonferroni correction $\alpha = .01$) revealed that the main effect for icon was statistically significant for all dependent variables, understandability, $F(4, 520) = 48.32$, $p < .05$, partial $\eta^2 = .271$, carefulness, $F(4, 520) = 20.89$, $p < .05$, partial $\eta^2 = .138$, likelihood of danger, $F(4, 520) = 19.10$, $p < .05$, partial $\eta^2 = .128$, attention-getting, $F(4, 520) = 22.16$, $p < .05$, partial $\eta^2 = .146$, and likelihood of avoidance, $F(4, 520) = 17.55$, $p < .05$, partial $\eta^2 = .119$. Subsequent Fisher-Hayter (Hayter, 1986) range tests were performed on the means of each icon for each dependent variable. For understandability, the mean of the Crying Baby icon was statistically significantly lower than all icons, all $ps < .01$, except for the Thumb down icon, $p > .05$. Understandability means for other icons did not differ statistically significantly, all $ps >$ .05. The No Children Under 18 icon was rated statistically significantly higher in carefulness than the Crying Baby icon, $p < .05$. All other icons were not statistically significantly different in their carefulness means, all $ps > .05$. Range tests on the likelihood of encountering danger means indicated that the No Children Under 18 icon was rated statistically significantly higher in carefulness than the Crying Baby icon, $p <$ .05. Range tests on attention-getting and avoidance means did not reveal any statistically significant differences among the icons, all $ps > .05$ (for all icon means, see Table 16).

The main effect for color was statistically significant for understandability, $F(1, 130)$ = 38.91, $p < .0001$, partial $\eta^2 = .230$, in which signal words printed in red ($M = 6.41$, SD = .128) were rated higher than signal words printed in black ($M = 6.20$, $SD = .133$); carefulness, $F(1, 130) = 25.49$, $p < .0001$, partial $\eta^2 = .164$, in which signal words printed in red ($M = 6.45$, $SD = .117$) were rated higher than signal words printed in black ($M = 6.28$, $SD = .120$); likelihood of encountering danger, $F(1, 130) = 45.29$, $p < .0001$, partial $\eta^2 = .258$, in which signal words printed in red ($M = 6.08$, $SD = .112$) were rated higher than signal words printed in black ($M = 5.81$, $SD = .117$), attention-getting, $F(1, 130) =$ 60.95, $p < .0001$, partial $\eta^2 = .319$, in which signal words printed in red ($M = 6.11$, $SD =$ .102) were rated higher than signal words printed in black ($M = 5.64$, $SD = .105$), but not for likelihood of avoidance, $p > .05$ (for color means, see Table 17).

The main effect for signal word was statistically significant for understandability, $F(1, 130) = 9.05$, $p < .01$, partial $\eta^2 = .065$, in which STOP ($M = 6.36$, $SD = .131$) was rated higher than WARNING ($M = 6.26$, $SD = .130$) and likelihood of avoidance, $F(1,$ 130) = 46.85, $p < .01$, partial $\eta^2 = .265$, in which STOP ($M = 6.24$, $SD = .140$) was rated higher than WARNING ($M = 6.07$, $SD = .136$), but not for carefulness, likelihood of encountering danger, and attention-getting, all ps $< .05$ (for signal word means, see Table 18).

The main effect for warning message was statistically significant for understandability, $F(2, 260) = 79.96$, $p < .01$, partial $\eta^2 = .381$, carefulness, $F(2, 260) =$ 180.81, $p < .01$, partial $\eta^2 = .595$, likelihood of encountering danger, $F(2, 260) = 246.94$, $p < .01$, partial $\eta^2 = .655$, attention-getting, $F(2, 260) = 181.62$, $p < .01$, partial $\eta^2 = .583$,

and likelihood of avoidance, $F(2, 260) = 222.05$, $p < .01$, partial $\eta^2 = .631$ (for warning message means, see Table 19).

Subsequent Fisher-Hayter range tests showed that message 3 was rated statistically significantly higher in understandability than message 1, $p < .005$, messages 1 and 2 and messages 2 and 3 were not found to be statistically significantly different in understandability, all ps > .05. For carefulness, message 3 was statistically significantly higher than both messages 1 and 2, ps < .05, and message 2 was statistically significantly higher than message 1, $p < .05$. The same results as for carefulness were obtained for likelihood of danger, attention-getting, and likelihood of avoidance means, all ps < .05.

Interactions.

A statistically significant icon x color x signal word x warning message interaction was found, $F(40, 88) = 9.52$, $p < .0001$, $\eta^2 = .812$, Wilks' $\Lambda = .135$. Likewise, color x signal word x warning message $F(10, 118) = 5.54$, $p < .0001$, $\eta^2 = .320$, Wilks' $\Lambda = .643$; icon x signal word x warning message, $F(40, 88) = 14.65$, $p < .0001$, $\eta^2 = .869$, Wilks' Λ = .088; signal word x warning message, $F(10, 118) = 19.88$, $p < .0001$, $\eta^2 = .812$, Wilks' $\Lambda = .304$; icon by color x warning message, $F(40, 88) = 8.40$, $p < .0001$, $\eta^2 = .792$, Wilks' $\Lambda = .146$; color x warning message, $F(10, 118) = 10.62$, $p < .0001$, $\eta^2 = .474$, Wilks' $\Lambda = .446$; icon x warning message, $F(40, 88) = 9.88$, $p < .0001$, $\eta^2 = .818$, Wilks' $\Lambda = .132$; icon x color by signal word, $F(20, 108) = 13.33$, $p < .0001$, $\eta^2 = .712$, Wilks' Λ = .212; color x signal word, F(5, 123) = 20,93, $p < .0001$, $\eta^2 = .460$, Wilks' $\Lambda = .471$; icon x signal word, $F(20, 108) = 9.75$, $p < .0001$, $\eta^2 = .644$, Wilks' $\Lambda = .259$; icon x color $F(20, 108) = 13.25$, $p < .0001$, $\eta^2 = .710$, Wilks' $\Lambda = .202$ interactions were statistically significant.

Subsequent univariate analyses (Bonferroni $\alpha = .01$) showed that the icon x color x signal word x warning message interaction was statistically significant for understandability, $F(8, 1040) = 5.74$, $p < .001$, partial $\eta^2 = .042$, carefulness, $F(8, 1040) = 8.27$, $p < .001$, partial $\eta^2 = .060$, likelihood of encountering danger, $F(8, 1040) = 7.21$, $p < .001$, partial $\eta^2 = .053$, attention-getting, $F(8, 1040) = 20.04$, $p < .001$, partial $\eta^2 = .134$, and avoidance, $F(8, 1040) = 48.27$, $p < .001$, partial $\eta^2 = .271$. The color x signal word x warning message interaction was statistically significant only for attention-getting, $F(2, 260) = 14.97$, $p < .001$, partial $\eta^2 = .103$ and likelihood of avoidance, $F(2, 260) = 31.89$, $p < .001$, partial $\eta^2 = .197$, but not for understandability, carefulness, or likelihood of encountering danger, $p > .05$.

The icon x signal word x warning message interaction was statistically significant for understandability $F(8, 1040) = 8.05$, $p < .001$, partial $\eta^2 = .058$, carefulness, $F(8, 1040) = 16.83$, $p < .001$, partial $\eta^2 = .115$, likelihood of encountering danger, $F(8, 1040) = 22.41$, $p < .001$, partial $\eta^2 = .147$, attention-getting, $F(8, 1040) = 18.89$, $p < .001$, partial $\eta^2 = .127$, and likelihood of avoidance, $F(8, 1040) = 44.51$, $p < .001$, partial $\eta^2 = .255$.

The signal word x warning message interaction was statistically significant for understandability, $F(2, 260) = 11.24$, $p < .001$, partial $\eta^2 = .080$, likelihood of encountering danger, $F(2, 260) = 22.26$, $p < .001$, partial $\eta^2 = .146$, attention-getting, $F(2, 260) = 26.34$, $p < .001$, partial $\eta^2 = .169$, likelihood of avoidance, $F(2, 260) = 67.60$, $p < .001$, partial $\eta^2 = .342$, and approached significance for carefulness, $p > .01$.

The icon x color x warning message interaction was statistically significant for understandability, $F(8, 1040) = 6.31$, $p < .001$, partial $\eta^2 = .043$, carefulness, $F(8, 1040) = 8.90$, $p < .001$, partial $\eta^2 = .064$, likelihood of encountering danger, $F(8, 1040) = 10.25$, p

$< .001$, partial $\eta^2 = .073$, attention-getting, $F(8, 1040) = 15.50$, $p < .001$, partial $\eta^2 = .107$, and likelihood of avoidance, $F(8, 1040) = 39.69$, $p < .001$, partial $\eta^2 = .234$.

The color x warning message interaction was statistically significant for likelihood of danger, $F(2, 260) = 8.99$, $p < .001$, partial $\eta^2 = .065$, attention-getting, $F(2, 260) = 17.75$, $p < .001$, partial $\eta^2 = .120$, and avoidance, $F(2, 260) = 42.46$, $p < .001$, partial $\eta^2 = .246$, but not for understandability or carefulness, $ps > .05$.

The icon x warning message interaction was statistically significant for understandability, $F(8, 1040) = 6.43$, $p < .001$, partial $\eta^2 = .046$, carefulness, $F(8, 1040) = 3.43$, $p < .005$, partial $\eta^2 = .026$, likelihood of encountering danger, $F(8, 1040) = 14.41$, $p < .001$, partial $\eta^2 = .100$, attention-getting, $F(8, 1040) = 28.32$, $p < .0001$, partial $\eta^2 = .179$, and likelihood of avoidance, $F(8, 1040) = 23.65$, $p < .001$, partial $\eta^2 = .154$.

The icon x color x signal word interaction was statistically significant for understandability, $F(4, 520) = 3.17$, $p < .05$, partial $\eta^2 = .024$, carefulness, $F(4, 520) = 4.30$, $p < .005$, partial $\eta^2 = .032$, likelihood of encountering danger, $F(4, 520) = 36.68$, $p < .0001$, partial $\eta^2 = .220$, attention-getting, $F(4, 520) = 27.39$, $p < .0001$, partial $\eta^2 = .174$, and likelihood of avoidance, $F(4, 520) = 36.07$, $p < .0001$, partial $\eta^2 = .217$.

The color x signal word interaction was statistically significant for carefulness, $F(1, 130) = 29.49$, $p < .0001$, partial $\eta^2 = .164$, likelihood of encountering danger, $F(1, 130) = 28.83$, $p < .0001$, partial $\eta^2 = .182$, attention-getting, and likelihood of avoidance, but not for understandability, $p > .05$.

The icon x signal word interaction was statistically significant for understandability, $F(4, 520) = 3.87$, $p < .0001$, partial $\eta^2 = .029$, carefulness, $F(4, 520) = 12.60$, $p < .0001$, partial $\eta^2 = .088$, likelihood of encountering danger, $F(4, 520) = 5.78$, $p < .0001$, partial $\eta^2 =$

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.053, attention-getting, $F(4, 520) = 12.15$, $p < .0001$, partial $\eta^2 = .085$, and likelihood of avoidance, $F(4, 520) = 28.15$, $p < .0001$, partial $\eta^2 = .178$.

The icon x color interaction was statistically significant for understandability, $F(4, 520) = 5.28$, $p < .0001$, partial $\eta^2 = .039$, carefulness, $F(4, 520) = 4.94$, $p < .005$, partial $\eta^2 = .037$, likelihood of encountering danger, $F(4, 520) = 33.79$, $p < .0001$, partial $\eta^2 = .206$, attention-getting, $F(4, 520) = 26.49$, $p < .0001$, partial $\eta^2 = .169$, and likelihood of avoidance, $F(4, 520) = 60.54$, $p < .0001$, partial $\eta^2 = .318$.

Tests of simple effects and range tests for statistically significant interactions.

Tests of simple effects were performed for the icon x color x signal word x warning message interaction. For each dependent variable (i.e., understandability, carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance) simple effects were performed at each combination of color and signal word (e.g., STOP printed in red, STOP printed in black, WARNING printed in red, and WARNING printed in black), as a function of icon and message. Additionally, because the interpretation of the icon x color x signal word x warning message interaction may overlook any color x signal word effects, simple effects for the color x signal word interaction were also interpreted. (see Figures 6 through 18 for adult graphs).

Understandability: icon x color x signal word x warning message interaction.

For the signal word STOP printed in red a statistically significant difference in understandability was found among the three messages for the Crying Baby icon, $F(2, 1040) = 64.34$, $p < .0001$. Range tests indicated that messages 1 and 2 scored statistically significantly lower than message 3, $p < .0001$, but there was no statistically significant difference between messages 1 and 2, $p < .05$. A statistically significant difference in

understandability was also found among the three messages for the Prohibit icon, $F(2,$ 1040) = 179.28, $p <$ .0001. Range tests showed that message 1 scored statistically significantly lower than messages 2 and 3, $ps <$ .0001, but no statistically significant difference was found between messages 2 and 3. A statistically significant difference in understandability was found among the three messages for the Boy icon, $F(2, 1040) =$ 46.55, $p <$ .0001. Range tests showed that message 1 scored statistically significantly lower than messages 2 and 3, $ps <$ .0001, but no statistically significant difference was found between messages 2 and 3. A statistically significant difference in understandability was also found among the three messages for the Thumb Down icon, $F(2, 1040) =$ 30.71, $p <$ .0001. Range tests showed that message 1 scored statistically significantly lower than messages 2 and 3, $ps <$ .0001, and message 2 scored statistically significantly lower than message 3.. A statistically significant difference in understandability was also found among the three messages for the No Children Under 18 icon, $F(2, 1040) =$ 13.03, $p <$ .0001. Range tests indicated that messages 1and 2 scored statistically significantly lower than message 3, $p <$ .0001, but there was no statistically significant difference between messages 2 and 3.

Statistically significant differences in understandability were also found among the five icons at message 1, $F(4, 1040) =$ 62.38, $p <$ .0001. Range tests showed that the Crying Baby icon scored statistically significantly lower in understandability than the No Children under 18 icon, the Thumb Down icon, the Boy icon, and the Prohibit icon, $ps <$ .0001. The Prohibit icon scored statistically significantly lower in understandability than the No Children Under 18 icon, $p <$ .0001, the Thumb Down icon, $p <$ .01, and the Boy icon, $p <$ .05. The Boy icon scored statistically significantly lower than the No Children

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Under 18 icon, $p < .0001$. Statistically significant differences in understandability were also found among the five icons at message 2, $F(4, 1040) = 72.91$, $p < .0001$. Range tests showed that the Crying Baby icon scored statistically significantly lower in understandability than the No Children under 18 icon, the Thumb Down, Boy, and Prohibit icons, $ps < .0001$. The Prohibit icon scored statistically significantly lower in understandability than the No Children Under 18 icon, $p < .0001$, the Thumb Down icon, $p < .01$, but not the Boy icon, $p > .05$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$, but did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon did not differ in understandability than the No Children Under 18 icon, $p = .712$. Statistically significant differences in understandability were also found among the five icons at message 3, $F(4, 1040) = 131.20$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower in understandability than the No Children under 18 icon, the Thumb Down icon, the Boy icon $ps < .0001$, and the Prohibit icon, $p < .05$. The Prohibit icon was statistically significantly lower in understandability than the No Children Under 18 icon, the Thumb Down icon, $ps < .0001$, and the Boy icon, $p < .001$.

For the signal word STOP printed in black a statistically significant difference in understandability was found among the three messages at Crying Baby icon, $F(2, 1040) = 41.31$, $p < .0001$. Range tests indicated that messages 1and 2 were statistically significantly lower than message 3, $p < .0001$, message 1 was also lower than message 2, $p < .0001$. Statistically significant differences among the three messages was found at the Prohibitive icon, $F(2, 1040) = 39.53$, $p < .0001$. Range tests indicated that messages 1and 2 were statistically significantly lower than message 3, $p < .0001$, message 1 was

also lower than message 2, $p < .001$. Statistically significant differences among the three messages were found at the Boy icon, $F(2, 1040) = 76.46$, $p < .0001$. Range tests indicated that messages 1and 2 were statistically significantly lower than message 3, message 1 was also lower than message 2, $p < .0001$. Statistically significant differences among the three messages was found at the Thumb Down icon, $F(2, 1040) = 18.30$, $p < .0001$. Range tests indicated that message 1and was statistically significantly lower than message 2, $p < .005$ and statistically significantly lower than message 3, $p < .0001$, message 2 was statistically significantly lower than message 3, $p < .005$. Statistically significant differences among the three messages was found at the No Children Under 18 icon, $F(2, 1040) = 27.80$, $p < .0001$. Range tests indicated that messages 1and 2 were statistically significantly lower than message 3 $p < .0001$.

Statistically significant differences were found among the five icons at message 1, $F(4, 1040) = 27.47$, $p < .0001$. The Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, $p < .0001$. No statistically significant differences were found among the other icons, all $ps > .05$. Statistically significant differences were found among the five icons at message 2, $F(4, 1040) = 36.92$, $p < .0001$. Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, $p < .0001$. The Prohibit icon was statistically significantly lower than Boy icon, $p < .05$, the Thumb Down and the No Children Under 18 icons $ps < .01$. Statistically significant differences were likewise found among the five icons at message 3, $F(4, 1040) = 26.08$, $p < .0001$. Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, $p < .0001$.

For the signal word WARNING printed in red a statistically significant difference in understandability was found among the three messages at Crying Baby icon, $F(2, 1040) = 67.21$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $p < .0001$. A statistically significant difference in understandability was found among the three messages at Prohibitive icon, $F(2, 1040) = 18.37$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower than message 2 and 3, and message 2 was statistically significantly lower than message 3, ps $< .0001$. A statistically significant difference in understandability was found among the three messages at the Boy icon, $F(2, 1040) = 58.31$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower than messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps $< .0001$. A statistically significant difference in understandability was found among the three messages at the Thumb Down icon, $F(2, 1040) = 46.41$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower than message 2 and 3 $p < .0001$, and message 2 scored statistically significantly lower than message 3, $p < .01$. A statistically significant difference in understandability was found among the three messages at the No Children Under 18 icon, $F(2, 1040) = 42.18$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower than messages 2 and 3 $p < .0001$, and message 2 scored statistically significantly lower than message 3, $p < .01$.

Statistically significant differences were also found among the five icons at message 1, $F(4, 1040) = 35.00$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than all of the other icons, all ps $< .0001$. The Prohibit

icon was statistically significantly higher than the Thumb Down and No Children Under 18 icons, $p < .0001$, but not the Boy ion, $p = .628$. The Boy icon scored statistically significantly lower than Thumb Down icon, $p < .001$, but did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .05$. Statistically significant differences were also found among the five icons at message 2, $F(4, 1040) = 21.53$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower in understandability than all other icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .05$, but did not differ statistically significantly from the Boy or No Children Under 18 icons, $ps > .05$. The Boy icon scored statistically significantly higher in understandability than the Thumb Down icon, $p < .05$, but not the No Children Under 18 icon, $p < .05$. The Thumb down icon was statistically significantly lower than the No Children Under 18 icon, $p > .05$. Statistically significant differences were also found among the five icons at message 3, $F(4, 1040) = 19.68$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower in understandability than all other icons, $ps < .001$. The Prohibit and Boy icons were statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < 0001$.

For the signal word WARNING in black a statistically significant difference in understandability was found among the three messages at Crying Baby icon, $F(2, 1040) = 60.48$, $p < .0001$. Range tests showed that message 3 scored statistically significantly higher in understandability than messages 1 and 2, $ps < .0001$, but no statistically significant difference was found between messages 2 and 3, $p > .05$. A statistically

significant difference in understandability was found among the three messages at Prohibitive icon, $F(2, 1040) = 38.34$, $p < .0001$. Range tests indicated that message 3 was scored statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. A statistically significant difference in understandability was found among the three messages at the Boy icon, $F(2, 1040) = 36.68$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. A statistically significant difference in understandability was found among the three messages at the Thumb Down icon, $F(2, 1040) = 59.91$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. A statistically significant difference in understandability was found among the three messages and at the No Children Under 18 icon, $F(2, 1040) = 52.91$, $p < .0001$. Range tests indicated that message 3 scored statistically significantly higher than messages 1 and 2, $ps < .0001$.

Statistically significant differences were also found among the five icons at message 1, $F(4, 1040) = 23.20$, $p < .0001$. The Crying Baby icon was scores statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, $ps < .0001$ and the Thumb Down icon, $p < .01$. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .0001$. The Boy icon scored statistically significantly higher in understandability than the Thumb Down icon, $p < .001$. The Thumb Down icon was statistically significantly lower in understandability than the No Children Under 18 icon, $p < .01$. Statistically significant differences were also found

among the five icons at message 2, $F(4, 1040) = 55.48$, $p < .0001$. The Crying Baby icon was scores statistically significantly lower than the Prohibit, Boy, and No Children Under 18 and the Thumb Down icons, $ps < .0001$. The Boy was statistically significantly lower in understandability than the No Children Under 18 icon, $p < .01$.

Statistically significant differences were also found among the icons at message 3, $F(4, 1040) = 15.38$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower in understandability than the Prohibit, Boy, and No Children Under 18 icons, $p < .0001$, as well as the Thumb Down icon, $p < .05$. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .01$. The Boy icon scored statistically significantly higher than the Thumb Down icon, $p < .05$. The Thumb Down icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .05$.

Because the univariate color x signal word interaction was not statistically significant for understandability, the simple effects for that interaction were not interpreted.

Carefulness: icon x color x signal word x warning message interaction.

For the signal word STOP in red a statistically significant difference in carefulness was found among the three messages at the Crying Baby icon, $F(2, 1040) = 252.02$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the Prohibit icon, $F(2, 1040) = 204.97$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 scored statistically significantly higher than message 3, all $ps < .0001$.

Statistically significant differences in carefulness among the three messages were also found at the Boy icon, $F(2, 1040) = 176.43$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 177.52$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 247.22$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 3, all $ps < .0001$.

Statistically significant differences in carefulness were also found among the five icons at message 1, $F(4, 1040) = 48.86$, $p < .0001$. The Crying Baby icon was statistically significantly lower in carefulness than the Prohibitive, Boy, and Thumb down icons, $p < .0001$, but did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. The Prohibit icon differed statistically significantly from the Thumb own icon, $p < .05$, the No Children Under 18 icon, $p < .001$, but not from the Boy icon, $p > .05$. The Boy icon was statistically significantly higher than both the Thumb Down and the No Children Under 18 icons, $p < .05$. The Thumb down icon scored statistically significantly higher than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in carefulness were also found at message 2, $F(4, 1040) = 27.39$, $p < .0001$. The Crying Baby icon was statistically significantly lower than the Prohibit

icon, the Boy icon, and the Thumb Down icon, $ps < .0001$. The Prohibit icon was

statistically significantly higher than the Boy, Thumb Down, and No Children Under 18

icons, $ps < .001$. The Boy icon scored statistically significantly higher than the No

Children Under 18 icon, $p < 05$. The Thumb Down icon was statistically significantly

higher than the No Children Under 18 icon, $p < .05$. Statistically significant differences

in carefulness were also found at message 3, $F(4, 1040) = 21.63$, $p < .0001$. Range tests

indicated that the Crying Baby icon was statistically significantly lower than the Prohibit

icon, Boy icon, and the Thumb Down icon, $p < .0001$. The Prohibit icon was statistically

significantly higher in carefulness than the Thumb Down icon, $p < .01$ and the No

Children Under 18 icon, $p < .0001$. The Boy icon was statistically significantly higher in

carefulness than the Thumb Down icon, $p < .01$ and the No Children Under 18 icon, $p <$

.0001.

For the signal word STOP in black a statistically significant difference in carefulness

was found among the three messages at Crying Baby icon, $F(2, 1040) = 223.93$, $p <$

.0001. Range tests indicated that message 3 was statistically significantly higher than

messages 1 and 2, and message 2 was statistically significantly higher than message 3, all

$ps < .0001$. Statistically significant differences in carefulness among the three messages

were also found at Prohibitive icon, $F(2, 1040) = 14.01$, $p < .0001$. Range tests indicated

that message 3 was statistically significantly higher than messages 1 and 2, and message

2 was scored statistically significantly higher than message 3, all $ps < .0001$. Statistically

significant differences in carefulness among the three messages were also found at the

Thumb Down icon, $F(2, 1040) = 177.52$, $p < .0001$. Range tests indicated that message 3

was statistically significantly higher than messages 1 and 2, and message 2 was scored

statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 214.11$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$.

Statistically significant differences in carefulness were also found among the five icons at message 1, $F(4, 1040) = 44.00$, $p < .0001$. The Crying Baby icon scored statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the Boy, Thumb Down, and No Children Under 18 icons, $ps < .001$. The Boy icon was statistically significantly higher than the No Children Under 18 icon, $p < .001$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .001$. Statistically significant differences in carefulness were also found among the five icons at message 2, $F(4, 1040) = 17.54$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and Thumb Down icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the No Children Under 18 icon, $p < .0001$, but did not differ statistically significantly from the other icons, $p > .05$. The Boy icon scored statistically significantly higher than the No Children Under 18 icon, $p < .001$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in carefulness were also found among the icons at message 3, $F(4, 1040) = 30.45$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower in carefulness than the Prohibit, Boy, Thumb Down, and

No Children Under 18 icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the No Children Under 18 icon, $p < .001$. The Boy icon was statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < .01$.

For the signal word WARNING in red a statistically significant difference in carefulness was found among the three messages at Crying Baby icon, $F(2, 1040) = 199.37$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at Prohibitive icon, $F(2, 1040) = 268.48$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the Boy icon, $F(2, 1040) = 192.00$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 201.33$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the three messages were also found and at the No Children Under 18 icon, $F(2, 1040) = 202.31$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$.

Statistically significant differences were also found in carefulness among the five icons at message 1, $F(4, 1040) = 11.96$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and the No Children Under 18 icons, $ps < .01$. The Boy icon was statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < .05$. Statistically significant differences were also found in carefulness among the five icons at message 2, $F(4, 1040) = 30.82$, $p < .0001$. The Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, all $ps < .001$. The Prohibit icon was statistically significantly higher that the Thumb Down icon, $p < .01$ and No Children Under 18 icon, $p < .0001$. The Boy icon scored statistically significantly higher than the Thumb Down icon, $p < .05$ and the No Children Under 18 icon, $p < .0001$. Statistically significant differences were also found in carefulness among the five icons at message 3, $F(4, 1040) = 20.38$, $p < .0001$. Range tests showed that the Crying Baby icon was scored statistically significantly lower than the Prohibit, Boy, and Thumb Down icons, $p < .0001$ and the No Children Under 18 icon, $p < .05$. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .05$ and No Children Under 18 icon, $p < .000$. The Boy icon was statistically significantly higher than the No Children Under 18 icon, $p < .05$.

For the signal word WARNING in black a statistically significant difference in carefulness was found among the three messages at the Crying Baby icon, $F(2, 1040) = 204.11$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all $ps < .0001$. Statistically significant differences in carefulness among the

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three messages were also found at the Prohibitive icon, $F(2, 1040) = 237.34$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 3, all ps $< .0001$. Statistically significant differences in carefulness among the three messages were also found at the Boy icon, $F(2, 1040) = 237.88$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 3, all ps $< .0001$. Statistically significant differences in carefulness among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 278.47$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than message1, $p < .0001$ and message 2, $p < .01$. Message 2 was statistically significantly higher than message 3, all ps $< .0001$. Statistically significant differences in carefulness among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 170.39$, $p < .0001$. Range tests indicated that message 3 scored statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 3, all ps $< .0001$.

Statistically significant differences in carefulness were also found among the five icons at message 1, $F(4, 1040) = 12.10$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower than the Prohibit icon, $p < .0001$, the Boy icon, the Thumb Down icon, and the No Children Under 18 icon, $p < .001$. The Prohibit icon was statistically significantly higher than the Boy icon, $p < .05$, the Thumb Down icon, and the No Children Under 18 icons, ps < 01. Statistically significant differences were also found in carefulness among the five icons at message 2, $F(4, 1040) = 45.73$, $p < .0001$. The Crying Baby icon was scored statistically significantly lower than the Boy

icon, $p < .05$. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .001$, statistically significantly higher than the Thumb Down icon, $p < .0001$. The Boy icon was statistically significantly higher than the Thumb Down icon, $p < .0001$ and the No Children Under 18 icon, $p < .001$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. Statistically significant differences were also found in carefulness among the five icons were found at message 3, $F(4, 1040) = 23.94$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and Thumb Down icons, $p < .0001$. The Prohibit icon scored statistically significantly higher than the Boy and the Thumb Down icons, $p < .01$ as well as the No Children Under 18 icon, $p < .01$. The Boy icon was statistically significantly higher than the No Children Under 18 icon, $p < .01$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .01$.

Carefulness: color x signal word interaction.

Tests of simple effects showed that there was no statistically significant difference between the word STP in red and the word STOP in black, $F(1, 130) = .455$, $p > .05$. The word WARNING in red was rated statistically significantly higher than the word WARNING in black, $F(1, 130) = 6.26$, $p < .05$. No statistically significant difference was found between the word STOP and the word WARNING in red, $F(1, 130) = .329$, $p > .05$. No statistically significant difference was found between the word STOP and the word WARNING in black, $F(1, 130) = 1.78$, $p > .05$.

Likelihood of encountering danger: icon x color x signal word x warning message interaction.

For the signal word STOP in red a statistically significant difference in likelihood of encountering danger was found among the three messages at the Crying Baby icon, $F(2, 1040) = 316.20$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Prohibit icon, $F(2, 1040) = 279.94$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Boy icon, $F(2, 1040) = 338.73$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 71.79$, $p < .0001$. Range tests showed that messages 1 and 2 did not differ statistically significantly in likelihood if encountering danger. However, message 3 was statistically significantly higher than messages 1 and 2, $p < .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 295.13$, $p < .0001$. Range tests indicated that message 3 was statistically significantly

higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps < .0001.

Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 1, $F(4, 1040) = 113.47$, $p < .0001$. Range tests showed that the Crying Baby icon was scores statistically significantly lower than the Prohibit, Boy, and Thumb Down icons, ps < .0001 as well as the No Children Under 18 icon, $p < .01$. The Prohibit icon was statistically significantly higher than the Boy icon, $p < .001$, Thumb Down icon, $p < .0001$, and the No Children Under 18 icon, $p < .001$. The Boy icon did not differ statistically significantly from the No Children Under 18 icon, but was statistically significantly lower than the Thumb Down icon, $p < .0001$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 2, $F(4, 1040) = 22.91$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower in likelihood of encountering danger than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, all ps < .0001. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .05$. The Boy icon was statistically significantly lower than the Thumb Down and No Children Under 18 icons, ps < .05. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 3, $F(4, 1040) = 18.41$, $p < .0001$. The Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and Thumb Down icons, ps < .0001 as well as the No Children Under 18 icon, $p < .05$. The Prohibit icon was

statistically significantly higher than the Thumb Down icon, $p < .01$ and the No Children Under 18 icon, $p < .0001$. The Boy icon did not differ statistically significantly from the Thumb Down icon, $p > .05$ and was statistically significantly higher than the No Children Under 18 icon, $p < .001$.

For the signal word STOP in black a statistically significant difference in likelihood of encountering danger was found among the three messages at Crying Baby icon, $F(2, 1040) = 390.30$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Prohibitive icon, $F(2, 1040) = 275.82$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Boy icon, $F(2, 1040) = 241.47$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 89.93$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower than messages 2 and 3, $p < .0001$, but there was no statistically significant difference between messages 2 and 3, $p > .05$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 305.82$, p

< .0001. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps < .0001.

Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 1, $F(4, 1040) = 45.25$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower in the likelihood of encountering danger than the Prohibit, Boy, Thumb Down, and No Children Under 18 icon, ps < .0001. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .01$.

Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 2, $F(4, 1040) = 16.42$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit and Boy icons, ps < .0001 as well as the and Thumb Down icon, $p < .001$. The Prohibit was statistically significantly higher than the Thumb Down and No Children Under 18 icons, ps < .001. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 3, $F(4, 1040) = 71.94$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, ps < .0001, and statistically significantly higher than the Thumb Down icon, $p < .0001$. The Prohibit icon was scored statistically significantly higher than the Thumb Down icon, $p < .0001$, but did not differ statistically significantly from the Boy and No Children Under 18 icons, ps > .05. The Boy icon was scored statistically significantly higher than the Thumb Down icon, $p <$

.0001. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$.

For the signal word WARNING in red a statistically significant difference in likelihood of encountering danger was found among the three messages at Crying Baby icon, $F(2, 1040) = 250.75$, $p < .0001$. Range tests indicated that message 3 scored statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all $ps < .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Prohibitive icon, $F(2, 1040) = 417.11$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all $ps < .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Boy icon, $F(2, 1040) = 320.71$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all $ps < .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 299.55$, $p < .0001$. Range tests indicated that message 3 was scored statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all $ps < .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 256.59$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than

messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps < .0001.

Statistically significant differences were also found in likelihood of encountering danger among the five icons at message 1, $F(4, 1040) = 7.19$, $p < .0001$. Range tests indicated that the Crying Baby icon did not differ statistically significantly from the Prohibit icon, $p > .05$, but was statistically significantly lower than the Boy, Thumb Down, and No Children Under 18 icons, ps < .001. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .05$, but did not differ statistically significantly from the Thumb Down icon and No Children Under 18 icon, ps > .05.

Statistically significant differences in likelihood of encountering danger were also found among the five icons message 2, $F(4, 1040) = 26.61$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, ps < .0001. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .001$. The Boy icon was statistically significantly higher than the Thumb Down icon, $p < .001$. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 3, $F(4, 1040) = 25.80$, $p < .0001$. Range tests indicated that the Crying Baby icon scored statistically significantly lower than the Prohibit, Boy, Thumb down (ps < .0001) and No Children Under 18 icons, $p < .001$. The Prohibit icon was statistically significantly higher than the Thumb Down and No Children Under 18 icons, $p < .01$. The Boy icon was statistically significantly higher than the No Children Under 18 icon, $p < .001$, but did not differ statistically significantly from the Thumb Down icon, $p > .05$.

For the signal word WARNING in black a statistically significant difference in likelihood of encountering danger was found among the three messages at Crying Baby icon, $F(2, 1040) = 349.13$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$.

Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Prohibitive icon, $F(2, 1040) = 280.21$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps $< .0001$.

Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Boy icon, $F(2, 1040) = 218.35$, $p < .0001$. Range tests indicated that message 3 was statistically significantly higher than messages 1 and 2, and message 2 was statistically significantly higher than message 1, all ps $< .0001$.

Statistically significant differences in likelihood of encountering danger among the three messages were also found at the Thumb Down icon, $F(2, 1040) = 120.31$, $p < .0001$. Range tests indicated that message 3 was scored statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$. Statistically significant differences in likelihood of encountering danger among the three messages were also found at the No Children Under 18 icon, $F(2, 1040) = 172.05$, $p < .0001$. Range tests indicated that message 3 was scored statistically significantly higher than messages 1 and 2, and message 2 was scored statistically significantly higher than message 1, all ps $< .0001$.

Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 1, $F(4, 1040) = 43.79$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, ps $< .0001$. The Prohibit icon was statistically significantly higher than the Boy icon, $p < .01$, statistically significantly lower than the No Children Under 18 icon, $p < .001$. The Boy icon was statistically significantly lower that the No Children Under 18 icon, $p < .001$, but did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .001$. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 2, $F(4, 1040) = 11.03$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower that the Boy and No Children Under 18 icons, ps $< .001$, but did not differ statistically significantly from the Boy or Thumb Down icons, ps $> .05$. The Prohibit icon was statistically significantly higher than the Boy and Thumb Down icons, ps $< .001$, and did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. The Boy icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .001$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .001$. Statistically significant differences in likelihood of encountering danger were also found among the five icons at message 3, $F(4, 1040) = 27.94$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit and No Children Under 18 icons, $p < .0001$. The Prohibit icon was statistically significantly higher than the Boy and Thumb Down icons, $p < .0001$, as well

as the No Children Under 18 icon, $p < .05$. The Boy icon was statistically significantly

higher than the Thumb Down icon, $p < .001$ and statistically significantly lower than the

No Children Under 18 icon, $p < .05$. The Thumb Down icon was scored statistically

significantly lower than the No Children Under 18 icon, $p < .0001$.

Likelihood of encountering danger: color x signal word interaction.

Tests of simple effects showed that the word STOP in red was rated statistically

significantly higher in likelihood of encountering danger than the word STOP in black,

$F(1, 130) = 10.40$, $p < .05$. No statistically significant difference was found between the

word WARNING in red and the word WARNING in black, $F(1, 130) = 1.62$, $p > .05$.

No statistically significant difference was found between the word STOP in red and the

word WARNING in red, $F(1, 130) = .584$, $p > .05$. Likewise, no statistically significant

difference was found between the word STOP in black and the word WARNING in

black, $F(1, 130) = 1.41$, $p > .05$.

Attention-getting: icon x color x signal word x warning message interaction.

For the signal word STOP in red a statistically significant difference in attention-

getting was found among the three messages at the Crying Baby icon, $F(2, 1040) =$

91.75, $p < .0001$. Range tests showed that message 1 was statistically significantly lower

in attention-getting than messages 2 and 3, and message 2 was statistically significantly

lower than message 3, ps $< .0001$. A statistically significant difference among the three

messages was found at the Prohibit icon, $F(2, 1040) = 77.71$, $p < .0001$. Range tests

showed that message 1 was statistically significantly lower in attention-getting than

messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps

$< .0001$. A statistically significant difference among the three messages was found at the

Boy icon, $F(2, 1040) = 138.54$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps $< .0001$. A statistically significant difference among the three messages was found at the Thumb Down icon, $F(2, 1040) = 103.67$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps $< .0001$. A statistically significant difference among the three messages was found at the No Children Under 18 icon, $F(2, 1040) = 109.63$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps $< .0001$.

Statistically significant differences in attention-getting were also found among the five icons at message 1, $F(4, 1040) = 11.02$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly higher than the Prohibited, Boy, Thumb Down, and No Children Under 18 icons, $p < .001$. Statistically significant differences in attention-getting were also found among the five icons at message 2, $F(4, 1040) = 17.98$, $p < .0001$. The Crying Baby icon was statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, ps $< .05$. The Prohibit icon was statistically significantly higher than the Boy, Thumb Down, and No Children Under 18 icons, ps $< .0001$. The Boy icon did not differ statistically significantly from the Thumb Down or No Children Under 18 icons, ps $> .05$. There was no statistically significant difference between the Thumb Down icon and the No Children Under 18 icon, $p > .05$. Statistically significant differences in attention-getting were also found among the five

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icons at message 3, $F(4, 1040) = 13.23$, $p < .0001$. Range tests indicated that the Crying

Baby icon was rated lower than the Prohibit, Boy, Thumb Down, No Children Under 18

icons, $p < .0001$. No statistically significant differences in attention-getting were found

among the other icons, all ps > .05.

For the signal word STOP in black a statistically significant difference in attention-

getting was found among the three messages at Crying Baby icon, $F(2, 1040) = 114.87$, p

$< .0001$. Range tests showed that message 1 was statistically significantly lower in

attention-getting than messages 2 and 3, and message 2 was statistically significantly

lower than message 3, $ps < .0001$. A statistically significant difference among the three

messages was found at Prohibitive icon, $F(2, 1040) = 122.54$, $p < .0001$. Range tests

showed that message 1 was statistically significantly lower in attention-getting than

messages 2 and 3, and message 2 was scored statistically significantly lower than

message 3, $ps < .0001$. A statistically significant difference among the three messages

was found at the Boy icon, $F(2, 1040) = 128.27$, $p < .0001$. Range tests showed that

message 1 was statistically significantly lower in attention-getting than messages 2 and 3,

and message 2 was statistically significantly lower than message 3, $ps < .0001$. A

statistically significant difference among the three messages was found at the Thumb

Down icon, $F(2, 1040) = 129.54$, $p < .0001$. Range tests showed that message 1 was

statistically significantly lower in attention-getting than messages 2 and 3, and message 2

was statistically significantly lower than message 3, $ps < .0001$. A statistically significant

difference among the three messages was found at the No Children Under 18 icon, $F(2,$

$1040) = 73.64$, $p < .0001$. Range tests showed that message 1 was statistically

significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$.

Statistically significant differences in attention-getting were also found among the five icons at message 1, $F(4, 1040) = 24.13$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, $p < .05$, but did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Prohibit icon was scored statistically significantly higher than the Boy and No Children Under 18 icons, $p < .0001$ and did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$ and did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in attention-getting were also found among the five icons at message 2, $F(4, 1040) = 9.13$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. The Prohibit icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .001$. Statistically significant differences in attention-getting were also found among the five icons at message 3, $F(4, 1040) = 11.34$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, $p < .001$. The Boy icon was scored statistically significantly higher than the Thumb Down icon, p

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< .001. The Thumb Down icon was scored statistically significantly lower than the No

Children Under 18 icon, $p < .001$.

For the signal word WARNING in red a statistically significant difference in

attention-getting was found among the three messages at Crying Baby icon, $F(2, 1040) =$

126.28, $p < .0001$. Range tests showed that message 1 was scored statistically

significantly lower in attention-getting than messages 2 and 3, and message 2 was

statistically significantly lower than message 3, ps $< .0001$. A statistically significant

difference among the three messages was found at Prohibit icon, $F(2, 1040) = 72.55$, $p <$

.0001. Range tests showed that message 1 was statistically significantly lower in

attention-getting than messages 2 and 3, and message 2 was statistically significantly

lower than message 3, ps $< .0001$. A statistically significant difference among the three

messages was found at the Boy icon, $F(2, 1040) = 150.47$, $p < .0001$. Range tests

showed that message 1 was statistically significantly lower in attention-getting than

messages 2 and 3, and message 2 was statistically significantly lower than message 3, ps

$< .0001$. A statistically significant difference among the three messages was found at the

Thumb Down icon, $F(2, 1040) = 129.77$, $p < .0001$. Range tests showed that message 1

was statistically significantly lower in attention-getting than message 2 and statistically

significantly higher than message 3. Message 2 was statistically significantly higher than

message 3, ps $< .0001$. A statistically significant difference among the three messages

was found at the No Children Under 18 icon, $F(2, 1040) = 74.36$, $p < .0001$. Range tests

showed that message 1 was statistically significantly lower in attention-getting than

messages 2 and 3, and message 2 was scored statistically significantly lower than

message 3, ps $< .0001$.

Statistically significant differences were also found in attention-getting among the five icons at message 1, $F(4, 1040) = 23.53$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than all other icons, ps < .0001. The Prohibit icon was statistically significantly higher than the Boy and Thumb Down icons, ps < .0001, but did not differ statistically significantly from the No Children Under 18 icon, $p < .05$. The Boy icon did not differ statistically significantly from the Thumb Down icon, $p > .05$, but was statistically significantly lower than the No Children Under 18 icon, $p < .001$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in attention-getting were also found among the five icons at message 2, $F(4, 1040) = 13.59$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Thumb Down, and No Children Under 18 icons, ps < .0001 as well as the Boy icon, $p < .05$. The Prohibit icon was statistically significantly higher than the Boy icon, $p < .001$. The Boy icon was statistically significantly lower than the Thumb Down icon, $p < .001$. Statistically significant differences in attention-getting were also found among the five icons at message 3, $F(4, 1040) = 194.92$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, ps < .0001 ad statistically significantly higher than the Thumb Down icon, $p < .0001$. The Prohibit icon was scored statistically significantly lower than the Thumb Down and No Children Under 18 icons, ps < .001. The Boy icon was scored statistically significantly higher than the No Children Under 18 icon, $p < .05$ and statistically significantly higher than the Thumb

Down icon, $p < .0001$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$.

For the signal word WARNING in black a statistically significant difference in attention-getting was found among the three messages at Crying Baby icon, $F(2, 1040) = 90.73$, $p < .0001$. Range tests showed that message 1 scored statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$. A statistically significant difference among the three messages was found at Prohibitive icon, $F(2, 1040) = 111.48$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$. A statistically significant difference among the three messages was found at the Boy icon, $F(2, 1040) = 144.04$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$. A statistically significant difference among the three messages was found at the Thumb Down icon, $F(2, 1040) = 80.77$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$. A statistically significant difference among the three messages was found and at the No Children Under 18 icon, $F(2, 1040) = 115.50$, $p < .0001$. Range tests showed that message 1 was statistically significantly lower in attention-getting than messages 2 and 3, and message 2 was statistically significantly lower than message 3, $ps < .0001$.

Statistically significant differences in attention-getting were also found among the five icons at message 1, $F(4, 1040) = 11.58$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Thumb Down, and No Children Under 18 icons, ps $< .001$, but did not differ statistically significantly from the Boy icon, $p > .05$. The Prohibit icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .0001$, but did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon was statistically significantly lower than the No Children Under 18 icon, $p < .01$. Statistically significant differences in attention-getting were also found among the five icons at message 2, $F(4, 1040) = 17.87$ $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than all other icons, ps $< .001$. The Prohibit icon was statistically significantly higher than the Boy and Thumb Down icons, ps $< .01$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .01$. The Thumb Down icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .05$. Statistically significant differences in attention-getting were also found among the five icons at message 3, $F(4, 1040) = 18.01$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, ps $< .0001$ as well as the Thumb Down icon, $p < .05$. The Prohibit icon was statistically significantly lower than the No Children Under 18 icon, $p < .001$. The Boy icon was statistically significantly lower than the No Children Under 18 icon, $p < .05$. The Thumb Down icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .0001$.

Attention-getting: color x signal word interaction.

Tests of simple effect for the color x signal word univariate interaction showed that the word STOP in red was statistically significantly higher in attention-getting than the word STOP in black, $F(1, 130) = 19.45$, $p < .05$. The word WARNING in red was also statistically significantly higher in attention-getting than the word WARNING in black, $F(1, 130) = 10.27$, $p < .05$. No statistically significant difference was found between the word STOP in red and the word WARNING in red, $F(1, 130) = .232$, $p > .05$ or the word STOP in black and the word WARNING in black, $F(1, 130) = .519$, $p > .05$.

Likelihood of avoidance: icon x color x signal word x warning message interaction.

For the signal word STOP in red a statistically significant difference in likelihood of avoidance was found among the three messages at the Crying Baby icon, $F(2, 1040) = 297.09$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Prohibit icon, $F(2, 1040) = 243.08$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Boy icon, $F(2, 1040) = 228.522$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages

was also found at the Thumb Down icon, $F(2, 1040) = 164.41$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all $ps < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the No Children Under 18 icon, $F(2, 1040) = 183.52$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$.

Statistically significant differences in likelihood of avoidance were also found among the five icons at message 1, $F(4, 1040) = 39.24$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower than all other icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the No Children Under 18 icon, $p < .05$, but did not differ statistically significantly from the Boy and Thumb Down icons, $ps > .05$. The Boy icon was scored statistically significantly higher than the No Children Under 18 icon, $p < .05$ and did not differ statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .01$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 1040) = 6.36$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly lower than the Prohibit and Thumb Down icons, $ps < .05$, but did not differ statistically significantly from the Boy and No Children Under 18 icons, $p > .05$. The Prohibit icon was statistically significantly higher than the No Children Under 18 icon, $p < .05$, but did not differ statistically significantly from the Boy or Thumb

Down icons, $p > .05$. The Boy icon did not differ statistically significantly from the

Thumb Down or the No Children Under 18 icons, $ps > .05$. The Thumb Down icon did

not differ statistically significantly from the No Children Under 18 icon, $p > .05$.

Statistically significant differences in likelihood of avoidance were also found among the

five icons at message 3, $F(4, 1040) = 21.88$, $p < .0001$. Range tests indicated that the

Crying Baby icon was scored statistically significantly lower than the Prohibit, Boy, and

Thumb Down icons, $p < .0001$. The Prohibit icon was statistically significantly higher

than the Thumb Down and No Children Under 18 icons, $ps < .001$, but did not differ

statistically significantly from the Boy icon, $p > .05$. The Boy icon was statistically

significantly higher than the No Children Under 18 icon, $p < .001$, but did not differ

statistically significantly from the Thumb Down icon, $p > .05$. The Thumb Down icon

did not differ statistically significantly from the No Children Under 18 icon, $p > .05$.

For the signal word STOP in black a statistically significant difference in likelihood

of avoidance was found among the three messages at Crying Baby icon, $F(2, 1040) =$

214.22, $p < .0001$. Range tests indicated that message 1 was scored statistically

significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was

statistically significantly lower than message 3, all $ps < .0001$.

A statistically significant difference in likelihood of avoidance among the three messages

was also found at the Prohibitive icon, $F(2, 1040) = 229.86$, $p < .0001$. Range tests

indicated that message 1 was statistically significantly lower in likelihood of voidance

than messages 2 and 3, and message 2 was statistically significantly lower than message

3, all $ps < .0001$. A statistically significant difference in likelihood of avoidance among

the three messages was also found at the Boy icon, $F(2, 1040) = 257.33$, $p < .0001$.

Range tests indicated that message 1 was scored statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Thumb Down icon, $F(2, 1040) = 173.97$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the No Children Under 18 icon, $F(2, 1040) = 163.36$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$.

Statistically significant differences in likelihood of avoidance were also found among the five icons at message 1, $F(4, 1040) = 18.34$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the rest of the icons, all ps < .001. The Prohibit icon was statistically significantly higher than the Boy icon, $p < .001$. The Boy icon was statistically significantly lower than the Thumb Down and No Children Under 18 icons, $ps < .0001$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 1040) = 13.46$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and No Children Under 18 icons, $p < .0001$. The Prohibit icon was scored statistically significantly higher than the Thumb Down icon, $p < .001$. The Thumb Down icon was statistically significantly lower than the No Children Under

18 icon, $p < .001$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 3, $F(4, 1040) = 13.92$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the rest of the icons, all ps $< .0001$. The Prohibit icon was statistically significantly higher than the Thumb Down or the No Children Under 18 icons, ps $< .05$. The Boy icon did not differ statistically significantly from the Thumb Down or the No Children Under 18 icons, ps $>$ .05.

For the signal word WARNING in red a statistically significant difference in likelihood of avoidance was found among the three messages at Crying Baby icon, $F(2, 1040) = 264.25$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Prohibitive icon, $F(2, 1040) = 252.02$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Boy icon, $F(2, 1040) = 254.78$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Thumb Down icon, $F(2, 1040) = 175.67$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in

likelihood of voidance than messages 2 and 3, and message 2 was statistically

significantly lower than message 3, all ps < .0001. A statistically significant difference in

likelihood of avoidance among the three messages was also found at the No Children

Under 18 icon, $F(2, 1040) = 1845.90$, $p < .0001$. Range tests indicated that message 1

was statistically significantly lower in likelihood of voidance than messages 2 and 3, and

message 2 was statistically significantly lower than message 3, all ps < .0001.

Statistically significant differences were also found in likelihood of avoidance among

the five icons at message 1, $F(4, 1040) = 525.91$, $p < .0001$. Range tests indicated that

the Crying Baby icon was statistically significantly lower than the Prohibit, Boy, and

Thumb Down icons, ps < .0001, but did not differ statistically significantly from the No

Children Under 18 icon, $p > .05$. The Prohibit icon was statistically significantly higher

than the No Children Under 18 icon, $p < .001$. The Boy icon was statistically

significantly higher than the No Children Under 18 icon, $p < .001$. The Thumb Down

icon was statistically significantly higher than the No Children Under 18 icon, $p < .001$.

Statistically significant differences in likelihood of avoidance were also found among the

five icons at message 2, $F(4, 1040) = 5.26$, $p < .0005$. Range tests indicated that the

Crying Baby icon was statistically significantly lower than the Boy icon, $p < .001$. The

Boy icon was statistically significantly higher than the Thumb Down icon, $p < .001$.

Statistically significant differences in likelihood of avoidance were also found among the

five icons at message 3, $F(4, 1040) = 12.39$, $p < .0001$. Range tests indicated that the

Crying Baby icon was statistically significantly lower than all other icons, ps < .05. The

Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .05$

and did not differ statistically significantly from the Boy and No Children Under 18

icons, $p > .05$. The Boy icon was statistically significantly higher than the Thumb Down icon, $p < .05$.

For the signal word WARNING in black a statistically significant difference in likelihood of avoidance was found among the three messages at Crying Baby icon, $F(2, 1040) = 325.98$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Prohibitive icon, $F(2, 1040) = 220.45$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Boy icon, $F(2, 1040) = 342.75$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of avoidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Thumb Down icon, $F(2, 1040) = 207.93$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the No Children Under 18 icon, $F(2, 1040) = 190.85$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of

avoidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all $ps < .0001$.

Statistically significant differences in likelihood of avoidance were also found among the five icons at message 1, $F(4, 1040) = 45.03$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the rest of the icons, all ps < .0001. The Prohibit icon did not differ statistically significantly from the Boy, Thumb Down, and No Children Under 18 icons, all $ps > .05$. The Boy icon did not differ statistically significantly from the Thumb Down and No Children Under 18 icons, $ps > .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 1040) = 24.29$ $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the other icons, $ps < .0001$. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 3, $F(4, 1040) = 30.66$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower than the other icons, all $ps < .0001$. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .0001$. The Boy icon was statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < .001$.

Likelihood of avoidance: color x signal word interaction.

Simple effects for the color x signal word interaction showed that there was no statistically significant difference between the word STOP in red and the word STOP in black, $F(1, 130) = 2.05$, $p > .05$. No statistically significant difference was found

between the word WARNING in red and the word WARNING in black, $F(1, 130) =$ .145, $p > .05$. The word STOP in red was statistically significantly higher than the word WARNING in red, $F(1, 130) = 5.70$, $p < .05$. There was no statistically significant difference between the word STOP in black was scored statistically significantly higher than the word WARNING in black, $F(1, 130) = .327$, $p < .05$.

Results Summary

Overall results showed that the Crying Baby and Thumb Down icons were scored lowest in understandability and the No Children Under 18 icon was rated highest in carefulness and likelihood of encountering danger. Signal words printed in red were scored significantly higher than signal words printed in black in understandability, carefulness, likelihood of encountering danger, and attention-getting. The signal word STOP was rated higher than the signal word WARNING in understandability and likelihood of avoidance. With regard to warning messages, message 1 (the least severe message) was scored significantly lower than message 2, and message 2 was scored significantly lower than message 3 (most sever message) in carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance means. For understandability, messages 2 and 3 did not differ from one another significantly, but both were scored higher than message 1.

Concerning the interactions, message 1 was scored lowest and message 2 highest when paired with either STOP or WARNING at each icon. However, at the Thumb Down icon, the effect of message differed for STOP printed in red and STOP printed in black for the likelihood of encountering danger variable, where message 2 did not differ

from message 1 for STOP printed in red and message 3 did not differ from message 2 for STOP printed in black.

Repeated Measures MANOVA – Control Condition Included, Collapsed Across Color - Adults

A second repeated measures (icon x signal word x warning message) MANOVA was performed on the adult data. This MANOVA included data from the control condition. The data were collapsed across color, to maintain a factorial design.

Main effects.

A statistically significant main effect was found for icon, $F(20, 251) = 26.35$, $p < .0001$, Wilks' $\Lambda = .323$, partial $\eta^2 = .677$, signal word, $F(10, 261) = 101.65$, $p < .0001$, Wilks' $\Lambda = .204$, partial $\eta^2 = .796$, and warning message, $F(10, 121) = 105.20$, $p < .0001$, Wilks' $\Lambda = .140$, partial $\eta^2 = .860$.

Follow-up univariate analyses (Bonferroni correction $\alpha = .01$) revealed that the main effect for icon was statistically significant for all dependent variables, understandability, $F(4, 1080) = 98.14$, $p < .0001$, partial $\eta^2 = .267$, carefulness, $F(4, 1080) = 50.31$, $p < .0001$, partial $\eta^2 = .157$, likelihood of encountering danger, $F(4, 1080) = 49.99$, $p < .0001$, partial $\eta^2 = .156$, attention-getting, $F(4, 1080) = 70.43$, $p < .0001$, partial $\eta^2 = .207$, and likelihood of avoidance, $F(4, 1080) = 31.96$, $p < .0001$, partial $\eta^2 = .106$. Follow-up Fisher-Hayter range tests were performed on the means of each icon for each dependent variable. For understandability, the mean of the Crying Baby icon was statistically significantly lower than all icons, all $ps < .05$. All understandability means for other icons did not differ statistically significantly, all $ps > .05$. For carefulness, the Crying Baby icon was statistically significantly lower than the Prohibit and Boy icons, $ps < .05$,

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but did not differ statistically significantly from the Thumb Down or No Children Under 18 icons, $ps > .05$. No other statistically significant differences in carefulness means were found among the icons, all $ps > .05$. For the likelihood of encountering danger the Crying Baby icon was statistically significantly lower than the Prohibit and No Children under 18 icons, $ps < .05$. No other statistically significant differences in the likelihood of encountering danger means were found among the icons, all $ps > .05$. Range tests on attention-getting showed that the Prohibit icon was statistically significantly higher than the Crying Baby and the Thumb Down icons, ps < .05. No other statistically significant differences were found among icons, all $ps > .05$. For likelihood of avoidance means did not reveal any statistically significant differences among the icons, all $ps > .05$ (for all icon means, see Table 20).

The main effect for signal word was statistically significant for understandability, $F(2, 540) = 459.72$, $p < .0001$, partial $\eta^2 = .630$, carefulness, $F(2, 540) = 398.00$, $p < .0001$, partial $\eta^2 = .596$, likelihood of encountering danger, $F(2, 540) = 292.14$, $p < .0001$, partial $\eta^2 = .520$, attention-getting, $F(2, 540) = 480.67$, $p < .0001$, partial $\eta^2 = .640$, and likelihood of avoidance, $F(2, 540) = 293.96$, $p < .0001$, partial $\eta^2 = .521$. Follow up range tests indicated that for understandability the control condition was scored statistically significantly lower than the signal words STOP and WARNING, $ps < .0001$, but the signal words STOP and WARNING did not differ statistically significantly from each other, $p > .05$. For carefulness, range tests showed that the control condition was statistically significantly lower than the signal words STOP and WARNING, $ps < .0001$, but the signal words STOP and WARNING did not differ statistically significantly from each other in carefulness, $p > .05$. For likelihood of encountering danger, range tests

showed that the control condition was statistically significantly lower than the signal

words STOP and WARNING, $ps < .0001$, but the signal words STOP and WARNING

did not differ statistically significantly from each other in the likelihood of encountering

danger, $p > .05$. For attention-getting, range tests showed that the control condition was

statistically significantly lower than the signal words STOP and WARNING, $ps < .0001$,

but the signal words STOP and WARNING did not differ statistically significantly from

each other in attention-getting, $p > .05$. Finally, for the likelihood of avoidance, range

tests showed that the control condition was statistically significantly lower than the

signal words STOP and WARNING, $ps < .0001$, but the signal words STOP and

WARNING did not differ statistically significantly from each other in the likelihood of

avoidance, $p > .05$ (for signal word means, see Table 21).

The main effect for warning message was statistically significant for

understandability, $F(3, 810) = 433.21$, $p < .0001$, partial $\eta^2 = .616$, carefulness, $F(3, 810)$

$= 852.94$, $p < .0001$, partial $\eta^2 = .760$, likelihood of encountering danger, $F(3, 810) =$

894.01, $p < .0001$, partial $\eta^2 = .768$, attention-getting, $F(3, 810) = 609.31$, $p < .0001$,

partial $\eta^2 = .693$, partial $\eta^2 = .583$, and likelihood of avoidance, $F(3, 810) = 705.31$, $p <$

$.0001$, partial $\eta^2 = .723$. Follow-up Fisher-Hayter range tests for understandability

showed that the control condition (no message) was statistically significantly lower in

understandability than message 1, 2, and 3, $ps < .0001$. Message 1 was statistically

significantly lower in understandability than message 2, $p < .0001$ and message 3, $p <$

$.05$. Messages 2 and 3 did not statistically significantly differ in understandability, $p >$

$.05$. Range tests performed on the carefulness means for the warning messages showed

that the control condition was statistically significantly lower in carefulness than

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messages 1, 2, and 3, *p*s < .0001. Message 1 was scored statistically significantly lower

in carefulness than messages 2 and 3, *p*s < .0001, and message 2 was statistically

significantly lower in carefulness than message 1, *p* < .001. Range tests performed on the

likelihood of encountering danger means for the warning messages showed that the

control condition was statistically significantly lower in carefulness than messages 1, 2,

and 3, *p*s < .0001. Message 1 was statistically significantly lower in carefulness than

messages 2 and 3, *p*s < .0001, and message 2 was statistically significantly lower in

carefulness than message 1, *p* < .0001. Range tests performed on the attention-getting

means for the warning messages showed the control condition was statistically

significantly lower in carefulness than messages 1, 2, and 3, ps < .0001. Message 1 was

statistically significantly lower in carefulness than messages 2 and 3, ps < .001, and

message 2 was statistically significantly lower in carefulness than message 1, *p* < .01.

Range tests performed on the likelihood of avoidance means for the warning messages

showed the control condition was statistically significantly lower in carefulness than

messages 1, 2, and 3, *p*s < .0001. Message 1 was statistically significantly lower in

carefulness than messages 2 and 3, *p*s < .001, and message 2 was scored statistically

significantly lower in carefulness than message 1, *p* < .01 (for message means see Table

22).

Interactions.

Statistically significant icon x signal word x warning message, $F(120, 151) = 20.01$, *p*

< .0001, $\eta^2 = .941$; signal word x warning message, $(30, 241) = 32.43$, $p < .0001$, $\eta^2 =$

.801; icon by warning message, $F(60, 211) = 27.12$, $p < .0001$, $\eta^2 = .885$; and icon x

signal word, F(40, 231) = 28.99, $p < .0001$, $\eta^2 = .834$ interaction were found for the adult

data when the control condition was included in the analyses.

Follow-up univariate analyses (Bonferroni α = .01) showed that the icon x signal

word x warning message interaction was statistically significant for understandability,

$F(24, 6480) = 27.63$, $p < .0001$, $\eta^2 = .093$, carefulness, $F(24, 6480) = 27.20$, $p < .0001$, η^2

= .092, likelihood of encountering danger, $F(24, 6480) = 22.61$, $p < .0001$, $\eta^2 = .071$,

attention-getting, $F(24, 6480) = 46.37$, $p < .0001$, $\eta^2 = .147$, and likelihood of avoidance,

$F(24, 6480) = 28.05$, $p < .0001$, $\eta^2 = .094$.

Follow up tests for the signal word x warning message interaction (Bonferroni α =

.01) showed that the interaction was statistically significant for understandability, $F(6,$

$1620) = 39.65$, $p < .0001$, $\eta^2 = .128$, carefulness, $F(6, 1620) = 107.86$, $p < .0001$, $\eta^2 =$

.128, likelihood of encountering danger, $F(6, 1620) = 60.78$, $p < .0001$, $\eta^2 = .184$,

attention-getting, $F(6, 1620) = 81.59$, $p < .0001$, $\eta^2 = .238$, and likelihood of avoidance,

$F(6, 1620) = 97.14$, $p < .0001$, $\eta^2 = .265$.

Follow-up tests for the icon x warning message interaction (Bonferroni α = .01)

showed that it was statistically significant for understandability, $F(12, 3240) = 27.72$, $p <$

.0001, $\eta^2 = .093$, carefulness, $F(12, 3240) = 33.61$, $p < .0001$, $\eta^2 = .111$, likelihood of

encountering danger, $F(12, 3240) = 50.57$, $p < .0001$, $\eta^2 = .158$, attention-getting, $F(12,$

$3240) = 37.26$, $p < .0001$, $\eta^2 = .121$, and likelihood of avoidance $F(12, 3240) = 49.16$, $p <$

.0001, $\eta^2 = .154$.

Follow-up tests for the icon x signal word interaction (Bonferroni α = .01) showed

that the interaction was statistically significant for understandability $F(12, 2160) = 10.48$,

$p < .0001$, $\eta^2 = .037$, carefulness, $F(12, 2160) = 33.85$, $p < .0001$, $\eta^2 = .111$, likelihood of

encountering danger, $F(12, 2160) = 21.81$, $p < .0001$, $\eta^2 = .075$, attention-getting, $F(12,$

$2160) = 73.04$, $p < .0001$, $\eta^2 = .213$, and likelihood of avoidance, $F(12, 2160) = 44.13$, p

$< .0001$, $\eta^2 = .141$.

Tests of simple effects and range tests for statistically significant interactions.

For this interaction simple effect were performed for signal word and warning

message at each icon.

Understandability: icon x signal word x warning message interaction.

For the Crying Baby icon, there were statistically significant differences among the

three signal word conditions at the control (no message) condition, $F(2, 6480) = 345.46$,

$p < .0001$, message 1, $F(2, 6480) = 94.78$, $p < .0001$, message 2, $F(2, 6480) = 7.73$, $p <$

.0005, and message 3, $F(2, 6480) = 27.61$, $p < .0001$. Range tests showed that at the

control (no warning message) condition, the control (no signal word) condition was

scored statistically significantly lower than STOP and WARNING, ps $< .0001$ and STOP

and WARNING did not differ statistically significantly from each other, $p > .05$. At

message 1, the control (no signal word) condition was statistically significantly lower

than STOP and WARNING, ps $< .0001$ and STOP and WARNING did not differ

statistically significantly from each other, $p > .05$. At message 2, the control (no signal

word) condition was statistically significantly lower than STOP and WARNING, ps $<$

.0001 and STOP and WARNING did not differ statistically significantly from each other,

$p > .05$. At message 3, the control (no signal word) condition was statistically

significantly lower than STOP and WARNING, ps $< .0001$ and STOP and WARNING

did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 780.96$, $p < .0001$, STOP $F(3, 6480) = 257.29$, $p < .0001$, and WARNING, $F(3, 6480) = 336.41$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$. At signal word STOP control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was scored statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Prohibit icon there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 46.50$, $p < .0001$, message 1, $F(2, 6480) = 109.90$, $p < .0001$, message 2, $F(2, 6480) = 21.28$, $p < .0005$, and message 3, $F(2, 6480) = 112.95$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, however, STOP and WARNING did not differ

statistically significantly from each other, $p > .05$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .000, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$. At message 3, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 487.28$, $p < .0001$, STOP $F(3, 6480) = 399.04$, $p < .0001$, and WARNING, $F(3, 6480) = 270.16$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was scored statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Boy icon there were statistically significant differences among the three signal word conditions at the control (no warning message) condition, $F(2, 6480) = 239.43$, $p < .0001$, message 1, $F(2, 6480) = 88.28$, $p < .0001$, message 2, $F(2, 6480) = 7.95$, $p <$

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.0005, and message 3, $F(2, 6480) = 93.74$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 1, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was statistically significantly lower than WARNING, $p < .0001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was scored statistically significantly higher than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 773.49$, $p < .0001$, STOP $F(3, 6480) = 336.36$, $p < .0001$, and WARNING, $F(3, 6480) = 623.07$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, however, no statistically significant difference was found between message 2 and message 3, $p > .05$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message)

was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Thumb Down icon there were statistically significant differences among the three signal word conditions at the control (no warning message) condition, $F(2, 6480) = 112.34$, $p < .0001$, message 1, $F(2, 6480) = 31.26$, $p < .0001$, message 2, $F(2, 6480) = 66.72$, $p < .0005$, and message 3, $F(2, 6480) = 35.14$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was scored statistically significantly lower than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 418.81$, $p < .0001$, STOP $F(3, 6480) = 542.87$, $p < .0001$, and WARNING, $F(3, 6480) = 656.93$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1

was statistically significantly lower than messages 2 and 3, *p*s < .001, and message 3 was statistically significantly lower than message 2. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001. Message 1 was statistically significantly lower than messages 2 and 3, *p*s < .001, and message 2 was statistically significantly lower than message 3, *p* < .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, *p*s < .001, and message 2 was statistically significantly lower than message 3, *p* < .0001.

For the No Children Under 18 icon there were statistically significant differences among the three signal word conditions at the control (no warning message) condition, $F(2, 6480) = 45.59$, $p < .0001$, message 1, $F(2, 6480) = 150.95$, $p < .0001$, message 2, $F(2, 6480) = 29.38$, $p < .0005$, and message 3, $F(2, 6480) = 14.94$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP did not statistically significantly differ from WARNING, $p > .05$. At message 1, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP was statistically significantly lower than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and

WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 468.67$, $p < .0001$, STOP $F(3, 6480) = 377.87$, $p < .0001$, and WARNING, $F(3, 6480) = 371.36$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 3 was statistically significantly lower than message 2. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$.

Carefulness: icon x signal word x warning message interaction.

For the Crying Baby icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 296.42$, $p < .0001$, message 1, $F(2, 6480) = 26.87$, $p < .0001$, message 2, $F(2, 6480) = 57.14$, $p < .0005$, and message 3, $F(2, 6480) = 15.68$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP and

WARNING did not differ statistically significantly from each other, $p > .05$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly lower than warning, $p < .0001$. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly lower than WARNING, $p < .0001$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 2063.83$, $p < .0001$, STOP $F(3, 6480) = 1263.05$, $p < .0001$, and WARNING, $F(3, 6480) = 1387.65$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was scored statistically significantly lower than message 3, p$< .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$.

For the Prohibit icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 258.25$, $p < .0001$, message 1, $F(2, 6480) = 67.73$, $p < .0001$, message 2, $F(2, 6480) = 6.66$, $p < .005$, and message 3, $F(2, 6480) = 53.74$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP and WARNING did not differ statistically significantly from each other, $p > .05$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly higher than warning, $p < .0001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly lower than WARNING, $p < .0001$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1999.02$, $p < .0001$, STOP $F(3, 6480) = 1290.22$, $p < .0001$, and WARNING, $F(3, 6480) = 1363.26$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2

and 3, ps < .001, and message 2 was statistically significantly lower than message 3, p < .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, p < .0001.

For the Boy icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 362.85$, p < .0001, message 1, $F(2, 6480) = 99.64$, p < .0001, message 2, $F(2, 6480) = 87.08$, p < .0001, and message 3, $F(2, 6480) = 116.13$, p < .0001. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, STOP and WARNING did not differ statistically significantly from each other, p > .05. At message 1, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, however, STOP and WARNING did not differ statistically significantly from each other, p > .05. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001 and STOP was statistically significantly lower than WARNING, p < .0001. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, STOP and WARNING did not differ statistically significantly from each other, p > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1770.11$, p < .0001, STOP $F(3, 6480) = 1124.41$, p < .0001, and WARNING, $F(3, 6480) = 813.77$, p < .0001.

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Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was scored statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, p$< .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Thumb Down icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 275.55$, $p < .0001$, message 1, $F(2, 6480) = 134.61$, $p < .0001$, message 2, $F(2, 6480) = 70.54$, $p < .0001$, and message 3, $F(2, 6480) = 17.98$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$. At message 1, the control (no signal word) condition was statistically significantly higher than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly higher than WARNING, $p < .001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 3, the control

(no signal word) condition was statistically significantly lower than STOP and

WARNING, ps < .0001, however, STOP and WARNING did not differ statistically

significantly from each other, p > .05.

Likewise, statistically significant differences were found among the four message

conditions at the control (no signal word) condition, F(3, 6480) = 2200.09, p < .0001,

STOP F(3, 6480) = 1337.12, p < .0001, and WARNING, F(3, 6480) = 1229.45, p <

.0001. Range tests showed that at the control (no signal word), control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001.

Message 1 was did not differ statistically significantly from message2, p > .05, but was

statistically significantly lower than message 3, p < .0001, and message 2 was

statistically significantly lower than message 3, p< .0001. At signal word STOP control

(no warning message) was statistically significantly lower than messages 1, 2, and 3, all

ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps <

.001, and message 2 was scored statistically significantly lower than message 3, p<

.0001. At signal word WARNING, control (no warning message) was statistically

significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically

significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically

significantly lower than message 3, p < .0001.

For the No Children Under 18 icon, there were statistically significant differences

among the three signal word conditions at the control (no message) condition, F(2, 6480)

= 207.33, p < .0001, message 1, F(2, 6480) = 66.15, p < .0001, message 2, F(2, 6480) =

8.25, p < .001, and message 3, F(2, 6480) = 32.61, p < .0001. Range tests showed that at

the control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly higher than WARNING, $p < .001$. At message 1, the control (no signal word) condition was statistically significantly higher than STOP and WARNING, $ps < .0001$, however, STOP did not statistically significantly differ from WARNING, $p > .05$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$ and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1420.46$, $p < .0001$, STOP $F(3, 6480) = 832.08$, $p < .0001$, and WARNING, $F(3, 6480) = 1073.56$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was did not differ statistically significantly from message2, $p > .05$, but was statistically significantly lower than message 3, $p < .0001$, and message 2 was scored statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly

lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, *p* < .0001.

Likelihood of encountering danger: icon x signal word x warning message interaction.

For the Crying Baby icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 196.81$, *p* < .0001, message 1, $F(2, 6480) = 43.24$, *p* < .0001, message 2, $F(2, 6480) = 31.07$, *p* < .001, and message 3, $F(2, 6480) = 24.60$, *p* < .0001. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP was statistically significantly higher than WARNING, *p* < .001. At message 1, the control (no signal word) condition was statistically significantly higher than STOP and WARNING, *p*s < .0001, and STOP was statistically significantly lower than WARNING, *p* < .0001. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, *p*s < .0001, however, STOP and WARNING did not differ statistically significantly, *p* > .05. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, *p*s < .0001, however, STOP and WARNING did not differ statistically significantly from each other, *p* > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 2472.76$, *p* < .0001, STOP $F(3, 6480) = 1888.58$, *p* < .0001, and WARNING, $F(3, 6480) = 1818.09$, *p* < .0001. Range tests showed that at the control (no signal word), control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001.

Message 1 was did not differ statistically significantly from message2, p > .05, but was

statistically significantly lower than message 3, p < .0001, and message 2 was statistically

significantly lower than message 3, p < .0001. At signal word STOP control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001.

Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and

message 2 was scored statistically significantly lower than message 3, p < .0001. At

signal word WARNING, control (no warning message) was statistically significantly

lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly

lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly

lower than message 3, p < .0001.

For the Prohibit icon, there were statistically significant differences among the three

signal word conditions at the control (no message) condition, $F(2, 6480) = 152.52$, p <

.0001, message 1, $F(2, 6480) = 64.35$, p < .0001, message 2, $F(2, 6480) = 64.11$, p <

.001, and message 3, $F(2, 6480) = 71.13$, p < .0001. Range tests showed that at the

control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps < .0001, and STOP did

not differ statistically significantly from WARNING, p > .05. At message 1, the control

(no signal word) condition was statistically significantly higher than STOP and

WARNING, ps < .0001, and STOP was statistically significantly higher than

WARNING, p < .0001. At message 2, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps < .0001, however, STOP

and WARNING did not differ statistically significantly, p > .05. At message 3, the

control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001; however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 220.30$, $p < .0001$, STOP $F(3, 6480) = 1941.68$, $p < .0001$, and WARNING, $F(3, 6480) = 1977.73$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was did not differ statistically significantly from message2, $p > .05$, but was statistically significantly lower than message 3, $p < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was scored statistically significantly lower than message 3, p< .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was statistically significantly lower than message 3, p< .0001.

For the Boy icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 191.83$, $p < .0001$, message 1, $F(2, 6480) = 82.68$, $p < .0001$, message 2, $F(2, 6480) = 20.98$, $p < .001$, and message 3, $F(2, 6480) = 67.41$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps < .0001, and STOP did

not differ statistically significantly from WARNING, p > .05. At message 1, the control

(no signal word) condition was statistically significantly higher than STOP and

WARNING, ps < .0001, however, STOP and WARNING did not statistically

significantly differ, p > .05. At message 2, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps < .0001, and STOP was

statistically significantly lower than WARNING, p < .001. At message 3, the control (no

signal word) condition was statistically significantly lower than STOP and WARNING,

ps < .0001, however, STOP and WARNING did not differ statistically significantly from

each other, p > .05.

Likewise, statistically significant differences were found among the four message

conditions at the control (no signal word) condition, $F(3, 6480) = 2325.35$, p < .0001,

STOP $F(3, 6480) = 1916.87$, p < .0001, and WARNING, $F(3, 6480) = 1805.30$, p <

.0001. Range tests showed that at the control (no signal word), control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001.

Message 1 was did not differ statistically significantly from message2, p > .05, but was

scored statistically significantly lower than message 3, p < .0001, and message 2 was

statistically significantly lower than message 3, p< .0001. At signal word STOP control

(no warning message) was statistically significantly lower than messages 1, 2, and 3, all

ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps <

.001, and message 2 was statistically significantly lower than message 3, p< .0001. At

signal word WARNING, control (no warning message) was statistically significantly

lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly

lower than messages 2 and 3, *p*s < .001, and message 2 was scored statistically

significantly lower than message 3, *p* < .0001.

For the Thumb Down icon, there were statistically significant differences among the

three signal word conditions at the control (no message) condition, $F(2, 6480) = 253.46$,

$p < .0001$, message 1, $F(2, 6480) = 109.32$, $p < .0001$, message 2, $F(2, 6480) = 9.72$, $p <$

.001, and message 3, $F(2, 6480) = 55.12$, $p < .0001$. Range tests showed that at the

control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP was

statistically significantly lower than WARNING, *p* < .001. At message 1, the control (no

signal word) did not differ statistically significantly from STOP, *p* > .05 and was cored

statistically significantly higher than WARNING, *p*s < .001. STOP was scored

statistically significantly higher than WARNING, *p* < .001. At message 2, the control (no

signal word) condition was scored statistically significantly lower than STOP and

WARNING, *p*s < .0001, and STOP did not differ statistically significantly from

WARNING, *p* > .05. At message 3, the control (no signal word) condition was scored

statistically significantly higher than STOP, and lower than WARNING, *p*s < .001.

STOP was scored statistically significantly lower than WARNING, *p* < .001.

Likewise, statistically significant differences were found among the four message

conditions at the control (no signal word) condition, $F(3, 6480) = 2623.67$, $p < .0001$,

STOP $F(3, 6480) = 1473.26$, $p < .0001$, and WARNING, $F(3, 6480) = 1767.05$, $p <$

.0001. Range tests showed that at the control (no signal word), control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001.

Message 1 was did not differ statistically significantly from message2, *p* > .05, but was

statistically significantly lower than message 3, $p < .0001$, and message 2 was

statistically significantly lower than message 3, $p < .0001$. At signal word STOP control

(no warning message) was statistically significantly lower than messages 1, 2, and 3, all

ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $<$

.001, and message 2 was statistically significantly lower than message 3, $p < .0001$. At

signal word WARNING, control (no warning message) was statistically significantly

lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly

lower than messages 2 and 3, ps $< .001$, and message 2 was statistically significantly

lower than message 3, $p < .0001$.

For the No Children Under 18 icon, there were statistically significant differences

among the three signal word conditions at the control (no message) condition, $F(2, 6480)$

$= 142.61$, $p < .0001$, message 1, $F(2, 6480) = 41.75$, $p < .0001$, message 2, $F(2, 6480) =$

85.33, $p < .001$, and message 3, $F(2, 6480) = 25.71$, $p < .0001$. Range tests showed that

at the control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was

statistically significantly lower than WARNING, $p < .001$. At message 1, the control (no

signal word) was statistically significantly lower than STOP and WARNING, ps $< .0001$,

and STOP was statistically significantly lower than WARNING, $p < .001$. At message 2,

the control (no signal word) condition was statistically significantly lower than STOP and

WARNING, ps $< .0001$, and STOP was statistically significantly lower than WARNING,

$p < .0001$. At message 3, the control (no signal word) condition was statistically

significantly lower than STOP and WARNING, ps $< .0001$, and STOP was statistically

significantly lower than WARNING, $p < .001$.

Likewise, statistically significant differences were found among the four message

conditions at the control (no signal word) condition, $F(3, 6480) = 1855.51$, $p < .0001$,

STOP $F(3, 6480) = 1605.77$, $p < .0001$, and WARNING, $F(3, 6480) = 1474.67$, $p <$

.0001. Range tests showed that at the control (no signal word), control (no warning

message) was scored statistically significantly lower than messages 1, 2, and 3, all $ps <$

.0001. Message 1 was did not differ statistically significantly from message2, $p > .05$,

but was statistically significantly lower than message 3, $p < .0001$, and message 2 was

statistically significantly lower than message 3, $p< .0001$. At signal word STOP control

(no warning message) was scored statistically significantly lower than messages 1, 2, and

3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3,

$ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

At signal word WARNING, control (no warning message) was statistically significantly

lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly

lower than messages 2 and 3, $ps < .001$, and message 2 was scored statistically

significantly lower than message 3, $p < .0001$

   Attention-getting: icon x signal word x warning message interaction.

   For the Crying Baby icon, there were statistically significant differences among the

three signal word conditions at the control (no message) condition, $F(2, 6480) = 221.08$,

$p < .0001$, message 1, $F(2, 6480) = 127.87$, $p < .0001$, message 2, $F(2, 6480) = 83.63$, $p <$

.001, and message 3, $F(2, 6480) = 50.68$, $p < .0001$. Range tests showed that at the

control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was

statistically significantly lower than WARNING, $p < .001$. At message 1, the control (no

signal word) was statistically significantly lower than STOP and WARNING, ps < .0001, and STOP was statistically significantly lower than WARNING, p < .001. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, however, there was no statistically significant difference between STOP and WARNING, p > .05. At message 3, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, and STOP was statistically significantly lower than WARNING, p < .001.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 898.35$, p < .0001, STOP $F(3, 6480) = 624.36$, p < .0001, and WARNING, $F(3, 6480) = 562.73$, p < .0001. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was did not differ statistically significantly from message2, p > .05, but was statistically significantly lower than message 3, p < .0001, and message 2 was statistically significantly lower than message 3, p < .0001. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .0001, and message 2 was statistically significantly lower than message 3, p < .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .001, and message 2 was scored statistically significantly lower than message 3, p < .0001.

For the Prohibit icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 242.09$, $p < .0001$, message 1, $F(2, 6480) = 225.08$, $p < .0001$, message 2, $F(2, 6480) = 162.58$, $p < .001$, and message 3, $F(2, 6480) = 142.32$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was statistically significantly lower than WARNING, $p < .001$. At message 1, the control (no signal word) was statistically significantly lower than STOP and WARNING, ps $< .0001$, however, STOP and WARNING did not differ statistically significantly, $p > .05$. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps $< .0001$, however, there was no statistically significant difference between STOP and WARNING, $p > .05$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, however, there was no statistically significant difference between STOP and WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 835.12$, $p < .0001$, STOP $F(3, 6480) = 928.68$, $p < .0001$, and WARNING, $F(3, 6480) = 611.51$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was did not differ statistically significantly from message2, $p > .05$, but was statistically significantly lower than message 3, $p < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning

message) was scored statistically significantly lower than messages 1, 2, and 3, all $ps <$

.0001. Message 1 was scored statistically significantly lower than messages 2 and 3, $ps <$

.0001, and message 2 was statistically significantly lower than message 3, $p < .0001$. At

signal word WARNING, control (no warning message) was scored statistically

significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was scored

statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was

statistically significantly lower than message 3, $p < .0001$.

For the Boy icon, there were statistically significant differences among the three

signal word conditions at the control (no message) condition, $F(2, 6480) = 181.06$, $p <$

.0001, message 1, $F(2, 6480) = 137.78$, $p < .0001$, message 2, $F(2, 6480) = 58.74$, $p <$

.001, and message 3, $F(2, 6480) = 137.67$, $p < .0001$. Range tests showed that at the

control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, $ps < .0001$, and no

statistically significant difference was found between STOP and WARNING, $p > .05$. At

message 1, the control (no signal word) was statistically significantly lower than STOP

and WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically

significantly, $p > .05$. At message 2, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was

statistically significantly lower than WARNING, $p < .0001$. At message 3, the control

(no signal word) condition was statistically significantly lower than STOP and

WARNING, $ps < .0001$, and STOP as found statistically significantly lower than

WARNING, $p < .001$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 770.73$, $p < .0001$, STOP $F(3, 6480) = 671.47$, $p < .0001$, and WARNING, $F(3, 6480) = 663.44$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Thumb Down icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 285.65$, $p < .0001$, message 1, $F(2, 6480) = 16.15$, $p < .0001$, message 2, $F(2, 6480) = 67.91$, $p < .001$, and message 3, $F(2, 6480) = 200.54$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and no STOP was statistically significantly lower than WARNING, $p < .001$. At message 1, the control (no signal word) condition was statistically significantly higher than STOP, $p < .001$, and statistically significantly lower than WARNING, $p < .0001$. STOP was scored

statistically significantly lower than WARNING $p < .001$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .0001$, and STOP was statistically significantly lower than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and statistically significantly higher than WARNING, ps $< .0001$, and STOP was statistically significantly higher than WARNING, $p < .001$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 914.09$, $p < .0001$, STOP $F(3, 6480) = 646.02$, $p < .0001$, and WARNING, $F(3, 6480) = 228.57$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 did not differ statistically significantly from message 2, $p > .05$, but was statistically significantly lower than message 3, $p < .0001$, and message 2 was scored statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than messages 2 and 3, ps $< .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than message 2 and statistically significantly higher than message 3, ps $< .001$, and message 2 was scored statistically significantly higher than message 3, $p < .0001$.

For the No Children Under 18 icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480)$

= 154.77, $p < .0001$, message 1, $F(2, 6480) = 53.53$, $p < .0001$, message 2, $F(2, 6480) =$ 150.93, $p < .001$, and message 3, $F(2, 6480) = 51.38$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly lower than WARNING, $p < .001$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$. However, no statistically significant difference was found between STOP and WARNING, $p > .05$. At message 2, the control (no signal word) condition was statistically significantly higher than STOP and WARNING, $p < .001$, and no statistically significant difference was found between STOP and WARNING, $p > .05$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, however, no statistically significant difference was found between STOP and WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1125.80$, $p < .0001$, STOP $F(3, 6480) = 519.40$, $p < .0001$, and WARNING, $F(3, 6480) = 444.92$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$. Message 2 was scored statistically significantly higher than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001. Message 1 was statistically significantly lower than message 2 and statistically significantly higher than message 3, *p*s < .001, and message 2 was statistically significantly higher than message 3, *p* < .0001.

Likelihood of avoidance: icon x signal word x warning message interaction.

For the Crying Baby icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 275.79$, $p < .0001$, message 1, $F(2, 6480) = 19.05$, $p < .0001$, message 2, $F(2, 6480) = 17.56$, $p < .001$, and message 3, $F(2, 6480) = 34.40$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, there was no statistically significant difference between the signal words STOP and WARNING, $p > .05.$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001. However, no statistically significant difference was found between STOP and WARNING, $p > .05$. At message 2, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $p < .001$, and STOP was statistically significantly higher than WARNING, $p < .001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, no statistically significant difference was found between STOP and WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1721.23$, $p < .0001$, STOP $F(3, 6480) = 1106.80$, $p < .0001$, and WARNING, $F(3, 6480) = 1118.73$, $p <$

.0001. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .0001. Message 2 was statistically significantly lower than message 3, p < .0001. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .0001, and message 2 was statistically significantly lower than message 3, p < .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was scored statistically significantly lower than messages 2 and 3, ps < .0001, and message 2 was statistically significantly lower than message 3, p < .0001.

For the Prohibit icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 234.03$, $p <$ .0001, message 1, $F(2, 6480) = 45.23$, $p < .0001$, message 2, $F(2, 6480) = 10.30$, $p <$ .001, and message 3, $F(2, 6480) = 86.92$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, there was no statistically significant difference between the signal words STOP and WARNING, p > .05.. At message 1, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, however, no statistically significant difference was found between STOP and WARNING, p > .05. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, p < .001, however, no statistically significant

difference was found between STOP and WARNING, $p > .05$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, however, no statistically significant difference was found between STOP and WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1472.32, p < .0001$, STOP $F(3, 6480) = 1049.52, p < .0001$, and WARNING, $F(3, 6480) = 1054.91, p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$. Message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

For the Boy icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 192.05, p < .0001$, message 1, $F(2, 6480) = 34.98, p < .0001$, message 2, $F(2, 6480) = 287.81, p < .001$, and message 3, $F(2, 6480) = 48.76, p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, ps < .0001, however, there was no statistically significant difference between the signal words STOP and WARNING, p > .05.. At message 1, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, ps < .0001, however, no statistically significant difference was found between STOP and WARNING, p > .05. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, p < .001, and STOP was statistically significantly lower than WARNING. At message 3, the control (no signal word) condition was statistically significantly lower than WARNING, p < .0001, and did not statistically significantly differ from STOP, p < .05. However, no statistically significant difference was found between STOP and WARNING, p > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1472.32$, p < .0001, STOP $F(3, 6480) = 1049.52$, p < .0001, and WARNING, $F(3, 6480) = 1054.91$, p < .0001. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was statistically significantly lower than messages 2 and 3, ps < .0001. Message 2 was statistically significantly lower than message 3, p < .0001. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 was scored statistically significantly lower than messages 2 and 3, ps < .0001, and message 2 was statistically significantly lower than message 3, p< .0001. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001.

Message 1 was statistically significantly lower than messages 2 and 3, ps < .0001, and message 2 was statistically significantly lower than message 3, p < .0001.

For the Thumb Down icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 6480) = 222.94$, p < .0001, message 1, $F(2, 6480) = 14.21$, p < .0001, message 2, $F(2, 6480) = 52.75$, p < .001, and message 3, $F(2, 6480) = 33.61$, p < .0001. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001, however, there was no statistically significant difference between the signal words STOP and WARNING, p > .05.. At message 1, no statistically significant differences were found between the control (no signal word) condition, STOP, and WARNING, p > .05. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, p < .001, but STOP and WARNING did not statistically significantly differ from one another, p > .05. At message 3, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, p < .0001, however, no statistically significant difference was found between STOP and WARNING, p > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1530.87$, p < .0001, STOP $F(3, 6480) = 1004.84$, p < .0001, and WARNING, $F(3, 6480) = 1011.99$, p < .0001. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps < .0001. Message 1 did not statistically significantly differ from message 2, p > .05 and was

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statistically significantly lower than message 3, *p* < .0001. Message 2 was statistically

significantly lower than message 3, *p* < .0001. At signal word STOP control (no warning

message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001.

Message 1 was statistically significantly lower than messages 2 and 3, *p*s < .0001, and

message 2 was statistically significantly lower than message 3, *p* < .0001. At signal word

WARNING, control (no warning message) was scored statistically significantly lower

than messages 1, 2, and 3, all *p*s < .0001. Message 1 was statistically significantly lower

than messages 2 and 3, *p*s < .0001, and message 2 was statistically significantly lower

than message 3, *p* < .0001.

For the No Children Under 18 icon, there were statistically significant differences

among the three signal word conditions at the control (no message) condition, $F(2, 6480)$

= 109.11, *p* < .0001, message 1, $F(2, 6480)$ = 384.61, *p* < .0001, message 2, $F(2, 6480)$ =

15.09, *p* < .001, and message 3, $F(2, 6480)$ = 12.01, *p* < .0001. Range tests showed that

at the control (no warning message) condition, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, *p*s < .0001, and STOP was

statistically significantly higher than WARNING, *p* < .0001. At message 1, the control

(no signal word) condition was statistically significantly lower than STOP and

WARNING, *p*s < .0001, and the word STOP was statistically significantly higher than

WARNING, *p* < .001. At message 2, the control (no signal word) condition was

statistically significantly lower than STOP and WARNING, *p* < .001, but STOP and

WARNING did not statistically significantly differ from one another, *p* > .05. At

message 3, no statistically significant differences were found among the control (no

signal word), STOP, and WARNING conditions, *p*s > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 6480) = 1255.03$, $p < .0001$, STOP $F(3, 6480) = 781.86$, $p < .0001$, and WARNING, $F(3, 6480) = 1598.67$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .0001$. Message 1 did not statistically significantly differ from message 2, $p > .05$ and was statistically significantly lower than message 3, $p < .0001$. Message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 did not statistically significantly differ from message 2, $p > .05$ and was statistically significantly lower than message 3, $p < .0001$. Message 2 was scored statistically significantly lower than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was scored statistically significantly lower than messages 2 and 3, all $ps < .0001$, and statistically significantly higher than message 1, $p < .001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was statistically significantly lower than message 3, $p < .0001$.

When the initial hypotheses for this study were made, it was not planned to collect data from minors, therefore, no hypotheses addressing children were made. Because the data were collected from minors, the following four analyses were used to analyze the data. The following analyses are exploratory in nature, and examine most of the possible variable effects and interactions.

Results Summary

Statistically significant differences among icons were found for all dependent variables, except for understandability. Crying baby icon was scored significantly lower than the other icons. The control signal word condition (no signal word) was scored significantly lower in all dependent variables than the words STOP and WARNING, but STOP and WARNING did not differ significantly from each other. Concerning the warning message, the main effect was significant for all dependent variables. The control condition (no message) and message 1 were scored significantly lower than messages 2 and 3, but messages 2 and 3 did not differ from one another.

Concerning the interactions, the control message condition was scored significantly lower than other message conditions when paired with either control, STOP, or WARNING at each icon for all dependent variables. The signal word STOP did not differ significantly from the signal word WARNING when paired with any of the message conditions, however, for the likelihood of avoidance variable at the No Children Under 18 icon, the signal word WARNING was scored significantly lower than the signal word STOP and the control signal word condition at message 1. At the Thumb Down icon (likelihood of avoidance variable), the three signal word conditions did not differ significantly from one another when paired with message 1, but followed the same patterns of differences for the control message condition, message 2, and message 3 as were observed with all other dependent variables.

Two Profile Analyses: Comparing the Profiles of Adults and Children

    Data analysis procedure.

Two profile analyses were performed using understandability and likelihood of avoidance as dependent measures and icon, signal word color, signal word, and warning message as repeated measures to test the adult data with the control condition excluded in the first analysis and included in the second analysis, while the data were collapsed across color in the latter. Age (adult / child) was used as a between-subjects variable. Assumptions for the profile analyses were examined to determine if they were reasonable for the data. Skewness measures for each variable cell were not extreme, mostly smaller than |1| with the largest value of -1.84. Data were screened for univariate outliers with the Descriptives and Explore functions in SPSS. No univariate outliers were found. Multivariate outliers were screened by computing Mahalanobis distance. Mahalanobis distances were computing using the chi squared criterion of $\chi^2_{(2)} = 5.99$. No multivariate outliers were found.

Profile Analysis: Comparing the profiles of Adults and Children -- Control Condition Removed

The basic aim of this analysis was to compare the response patterns of the minors and the adults with regard to the two dependent variables (understandability and likelihood of avoidance) that the minors were measured on. For this analysis, the control conditions were excluded (i.e., the responses to control conditions for signal word and warning message were not analyzed). Prior to performing the profile analysis, Kendall's Tau coefficient of agreement was computed for understandability (.154) and likelihood of avoidance (.244).

Main effects.

The main effect for the age variable (adult/child) was not statistically significant, $F(2, 252) = .017$, $p = .983$, Wilks' $\Lambda = .1.00$, $\eta^2 = .0001$. All of the other main effects for the within subject variables were statistically significant; icon $F(8, 246) = 5.88$, $p < .0001$, Wilks' $\Lambda = .839$, partial $\eta^2 = .161$, color $F(2, 252) = 3.26$, $p = < .05$, Wilks' $\Lambda = .975$, $\eta^2 = .025$, signal word $F(2, 252) = 7.40$, $p = < .001$, Wilks' $\Lambda = .945$, $\eta^2 = .055$, and warning message $F(4, 250) = 17.61$, $p = < .0001$, Wilks' $\Lambda = .780$, partial $\eta^2 = .220$. Because these main effects are similar to the main effect found in the adult data and a separate set of analyses were performed for the children's data, the within-subject variable main effects were not interpreted here.

Interaction effects.

Similarly to the main effect for age, none of the interaction effects that included the age variable were statistically significant. However, all of the interactions for the within-subject variables were statistically significant, icon x signal word x message, $F(16, 4048) = 6.94$, $p < .0001$, partial $\eta^2 = .027$, signal word x message, $F(4, 1012) = 17.13$, $p < .0001$, partial $\eta^2 = .063$, icon x color x message, $F(16, 4048) = 7.67$, $p < .0001$, partial $\eta^2 = .029$, color x message, $F(4, 1012) = 5.10$, $p < .0001$, partial $\eta^2 = .020$, icon x message, $F(16, 4048) = 19.21$, $p < .0001$, partial $\eta^2 = .071$, icon x color x signal word, $F(8, 2024) = 8.04$, $p < .0001$, partial $\eta^2 = .031$, color x signal word, $F(2, 252) = 9.35$, $p < .0001$, $\eta^2 = .069$, icon x signal word, $F(8, 2024) = 5.21$, $p < .0001$, partial $\eta^2 = .020$, and icon x color, $F(8, 2024) = 3.29$, $p = .001$, partial $\eta^2 = .027$. Because these interaction effects are similar to those found in the adult data and a separate set of analyses were performed for the children's data, the within-subject variable interactions were not interpreted here.

Profile Analysis: Comparing the Profiles of Adults and Children – Control

Condition Included, Collapsed Across Color

The basic aim of this analysis, similarly to the previous analysis, was to compare the

response patterns of the minors and the adults with regard to the two dependent variables

(understandability and likelihood of avoidance) that the minors were measured on. For

this analysis, the control conditions were included, but the data were collapsed across

color to maintain a factorial design, since color occurred only in the conditions where a

signal word was present.

Main effects.

The main effect for the age variable (adult/child) was not statistically significant, $F(2,$

$309) = .946, p = .983, \eta^2 = .389$. All of the other main effects for the within subject

variables were statistically significant for icon $F(8, 303) = 4.60, p < .0001$, partial $\eta^2 =$

.108, signal word $F(4, 307) = 17.25, p = < .001, \eta^2 = .184$, and warning message $F(4,$

$250) = 23.36, p = < .0001$, partial $\eta^2 = .315$. Because these main effects are similar to the

main effect found in the adult data and a separate set of analyses were performed for the

children's data, the within-subject variable main effects were not interpreted here.

Interaction effects.

Similarly to the main effect for age, none of the interaction effects that included the

age variable were statistically significant. However, all of the interactions for the within-

subject variables were statistically significant; icon x signal word x message, $F(48, 263)$

$= 5.01, p < .0001$, partial $\eta^2 = .478$, signal word x message, $F(8, 299) = 8.10, p < .0001,$

partial $\eta^2 = .245$, icon x message, $F(24, 287) = 23.34, p < .0001$, partial $\eta^2 = .661$, and

icon x signal word, $F(16, 295) = 3.19, p < .0001$, partial $\eta^2 = .147,$. Because these

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interaction effects are similar to those found in the adult data and a separate set of analyses were performed for the children's data, the within-subject variable interactions were not interpreted here.

Two Repeated Measures MANOVAs – Children

Data analysis procedure.

Two repeated measures within-subject MANOAVs were performed using understandability and likelihood of avoidance as dependent measures and icon, signal word color, signal word, and warning message as repeated measures to test the adult data with the control condition excluded in the first analysis and included in the second analysis, while the data were collapsed across color in the latter. Age (adult / child) was used as a between-subjects variable. Assumptions for the profile analyses were examined to determine if they were reasonable for the data. Skewness measures for each variable cell were not extreme, mostly smaller than |1| with the largest value of -1.84. Data were screened for univariate outliers with the Descriptives and Explore functions in SPSS. No univariate outliers were found. Multivariate outliers were screened by computing Mahalanobis distance. Mahalanobis distances were computing using the chi squared criterion of $\chi^2_{(2)} = 5.99$. No multivariate outliers were found.

Repeated Measures MANOVA: Control Condition Excluded - Children

Due to a small sample size, no between-subject variables were used in this analysis. Only the effects of the within subject variables (icon, color, signal word, and warning message) and interactions among those variables were examined.

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Main effects.

The main effects for icon and color were not statistically significant, $ps > .05$. However, statistically significant main effects were found for signal word $F(2, 6) = 8.05$, $p < .05$, Wilks' $\Lambda = .271$, $\eta^2 = .729$ and warning message, $F(4, 28) = 8.24$, $p < .0001$, Wilks' $\Lambda = .200$, partial $\eta^2 = .132$ (for means, see Tables 23 and 24).

Follow-up univariate analyses (Bonferroni $\alpha = .025$) revealed that the main effect for signal word was not statistically significant for understandability, $p = .146$, but was statistically significant for likelihood of avoidance, $F(1, 7) = 7.56$, $p = .655$, $\eta^2 = .519$. The signal word STOP ($M = 6.21$, $SD = .400$) was statistically significantly higher in likelihood of avoidance than the signal word WARNING ($M = 5.97$, $SD = .391$). Follow-up univariate analyses for the main effect of warning message showed that it was statistically significant for both understandability, $F(2, 14) = 6.13$, $p = .012$, partial $\eta^2 = .467$ and likelihood of avoidance, $F(2, 14) = 9.01$, $p < .01$, partial $\eta^2 = .563$. Each univariate result was followed up by range tests to determine the differences among messages. For understandability, range tests showed that message 1 was scored statistically significantly lower than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$. Likewise, for likelihood of avoidance, range tests showed that message 1 was statistically significantly lower than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all $ps < .0001$.

Interactions.

Most of the interactions for the children's data were statistically significant, icon x color x signal word x warning message, $F(16, 112) = 3.34$, $p < .0001$, partial $\eta^2 = .323$, icon x signal word x warning message, $F(16, 112) = 2.78$, $p < .01$, partial $\eta^2 = .291$,

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signal word x warning message $F(16, 112) = 3.24$, $p < .05$, partial $\eta^2 = .328$, icon x color

x warning message, $F(16, 112) = 2.37$, $p < .01$, partial $\eta^2 = .253$, color x warning

message, $F(4, 28) = 3.86$, $p < .0001$, partial $\eta^2 = .339$, icon x warning message, $F(16,$

$112) = 5.08$, $p < .0001$, partial $\eta^2 = .421$, icon x color x signal word $F(8, 56) = 2.94$, $p <$

$.01$, partial $\eta^2 = .296$, color x signal word, $F(2, 6) = 7.92$, $p < .05$, partial $\eta^2 = .709$, and

icon x signal word, $F(8, 56) = 2.48$, $p < .05$, partial $\eta^2 = .262$. The color x signal word x

warning message, and the icon x color interactions were not statistically significant, ps $>$

$.05$.

Follow-up univariate results (Bonferroni $\alpha = .025$) showed that the icon x color x

signal word x warning message interaction was statistically significant for likelihood of

avoidance $F(8, 56) = 5.68$, $p < .0001$, partial $\eta^2 = .448$, but not for understandability, $p >$

$.05$. The icon x signal word x warning message was approaching significance for

understandability, $p = .029$, and was statistically significant for likelihood of avoidance,

$F(8, 56) = 2.36$, $p < .01$, partial $\eta^2 = .341$. The signal word x warning message

interaction was not statistically significant for understandability, $p = > .05$, but was

statistically significant for likelihood of avoidance, $F(2, 14) = 11.55$, $p < .01$, partial $\eta^2 =$

$.623$. The icon x color x warning message interaction was likewise not statistically

significant for understandability, $p > .05$, but was statistically significant for likelihood of

avoidance, $F(8, 56) = 2.76$, $p < .05$, partial $\eta^2 = .283$. The color x warning message

interaction was not statistically significant for understandability, $p > .05$, but was

statistically significant for likelihood of avoidance, $F(2, 14) = 4.44$, $p < .05$, partial $\eta^2 =$

$.388$. The icon x warning message interaction was not statistically significant for

understandability, $p > .05$, but was statistically significant for likelihood of avoidance,

$F(8, 56) = 15.99$, $p < .0001$, partial $\eta^2 = .696$. The icon x color x signal word interaction was not statistically significant for understandability, $p > .05$, but was statistically significant for likelihood of avoidance, $F(4, 28) = 5.78$, $p < .01$, partial $\eta^2 = .453$. The color x signal word interaction was not statistically significant for likelihood of avoidance, $p > .05$, but was statistically significant for likelihood of avoidance, $F(1, 7) = 9.07$, $p < .01$, partial $\eta^2 = .703$. Finally, the icon x signal word interaction was not statistically significant for understandability, $p > .05$, but was statistically significant for likelihood of avoidance, $F(4, 28) = 4.47$, $p < .01$, partial $\eta^2 = .390$.

Tests of simple effects and range tests for statistically significant interactions.

Tests of simple effects were performed for the icon x color x signal word x warning message interaction. For the statistically significant dependent variable (likelihood of avoidance) simple effects were performed at each combination of color and signal word (e.g., STOP in red, STOP in black, WARNING in red, and WARNING in black), comparing the means of each icon at each message. Additionally, because the interpretation of the icon x color x signal word x warning message interaction may miss any color x signal word effects, simple effects for the color x signal word interaction were also interpreted for the statistically significant likelihood of avoidance dependent variable.

Likelihood of avoidance: icon x color x signal word x warning message interaction.

For the signal word STOP in red a statistically significant difference in likelihood of avoidance was found among the three messages at the Crying Baby icon, $F(2, 56) = 60.85$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of avoidance than message 2 and statistically

significantly higher than message 3, $ps < .001$. Message 2 was statistically significantly

higher than message 3, all $ps < .0001$. A statistically significant difference in likelihood

of avoidance among the three messages was also found at the Prohibit icon, $F(2, 56) =$

52.48, $p < .0001$. Range tests indicated that message 1 was statistically significantly

lower in likelihood of avoidance than message 2 and statistically significantly higher than

message 3, $ps < .001$. Message 2 was scored statistically significantly higher than

message 3, all $ps < .0001$. A statistically significant difference in likelihood of avoidance

among the three messages was also found at the Boy icon, $F(2, 56) = 43.39, p < .0001$.

Range tests indicated that message 1 was statistically significantly lower in likelihood of

avoidance than message 2 and statistically significantly higher than message 3, $ps <$

.0001. Message 2 was statistically significantly higher than message 3, all $ps < .0001$. A

statistically significant difference in likelihood of avoidance among the three messages

was also found at the Thumb Down icon, $F(2, 56) = 7.02, p < .001$ Range tests indicated

that message 1 and message 2 did not differ statistically significantly from one another, p

$> .05$, but message 1 was statistically significantly lower than message 3, $p < .001$.

Message 2 was statistically significantly lower than message 3, $p < .05$. A statistically

significant difference in likelihood of avoidance among the three messages was also

found at the No Children Under 18 icon, $F(2, 56) = 4.01, p < .05$. Range tests indicated

that message 1 was statistically significantly higher than message 2, $p < .01$, but did not

differ statistically significantly from message 3, $p > .05$. Message 2 was statistically

significantly lower than message 3, $p < .05$.

Statistically significant differences in likelihood of avoidance were also found among

the five icons at message 1, $F(4, 56) = 4.98, p < .01$. Range tests indicated that the

Crying Baby icon was scored statistically significantly higher than the Thumb Down icon, $p < .05$, but did not differ statistically significantly from all other icons, $ps > .05$. The Prohibit icon did not differ statistically significantly from the other icons, $p > .05$. The Boy icon was statistically significantly higher than the Thumb Down icon, $p < .001$ and did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. The Thumb Down icon was scored statistically significantly lower than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 56) = 13.49$, $p < .0001$. Range tests showed that the Crying Baby icon was statistically significantly higher than the Thumb Down and No Children Under 18 icons, $ps < .001$, but did not differ statistically significantly from the Crying Baby or the Boy icons, $ps > .05$. The Prohibit icon was statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < .0001$, but did not differ statistically significantly from the Boy icon, $p > .05$. The Boy icon was statistically significantly higher than the Thumb Down or the No Children Under 18 icons, $ps < .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 3, $F(4, 56) = 29.34$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly lower than the Prohibit, Boy, Thumb Down, and No Children Under 18 icons, $p < .0001$, but did not differ statistically significantly from the Prohibit icon, $p > .05$. The Prohibit icon was scored statistically significantly lower than the Boy, Thumb Down, and No Children Under 18 icons, $ps < .001$. The Boy icon was statistically significantly lower than the Thumb Down and No Children Under 18 icons,

*p*s < .0001. The Thumb Down icon did not differ statistically significantly from the No

Children Under 18 icon, *p* > .05.

For the signal word STOP in black a statistically significant difference in likelihood

of avoidance was found among the three messages at Crying Baby icon, $F(2, 56) =$

105.94, *p* < .0001. Range tests indicated that message 1 was statistically significantly

lower in likelihood of avoidance than messages 2, *p* < .01 and 3, *p* < .0001. Message 2

was statistically significantly higher than message 3, *p* < .0001. A statistically significant

difference in likelihood of avoidance among the three messages was also found at the

Prohibitive icon, $F(2, 56) = 32.34$, *p* < .0001. Range tests indicated that message 1 did

not differ statistically significantly from message 2, *p* > .05 and was statistically

significantly higher than message3, *p* < .0001. Message 2 was statistically significantly

higher than message 3, *p* < .0001. A statistically significant difference in likelihood of

avoidance among the three messages was also found at the Boy icon, $F(2, 56) = 13.52$, *p*

< .0001. Range tests indicated that message 1 was statistically significantly lower in

likelihood of voidance than messages 2, *p* < .0001, but did not differ statistically

significantly from message 3, *p* > .05. Message 2 was scored statistically significantly

higher than message 3, *p* < .0001. A statistically significant difference in likelihood of

avoidance among the three messages was also found at the Thumb Down icon, $F(2, 56) =$

13.17, *p* < .0001. Range tests indicated that message 1 did not differ statistically

significantly from message 2, *p* > .05 and was statistically significantly lower than

message 3, *p* < .0001. Message 2 was statistically significantly lower than message 3, *p*

< .0001. A statistically significant difference in likelihood of avoidance among the three

messages was also found at the No Children Under 18 icon, $F(2, 56) = 4.98$, *p* < .05.

Range tests indicated that there was no statistically significant difference between message 1 and 2, $p > .05$ and message 1 was statistically significantly lower in likelihood of voidance than message 3, $p < .01$. Message 2 was statistically significantly lower than message 3, $p < .01$.

Statistically significant differences in likelihood of avoidance were also found among the five icons at message 1, $F(4, 56) = 3.95$, $p < .01$. Range tests indicated that the Crying Baby icon did not differ statistically significantly from the other icons, all ps > .05. The Prohibit icon was statistically significantly higher than the Thumb Down icon, $p < .01$, but did not differ statistically significantly from the other icons, ps > .05. The Boy icon was statistically significantly higher than the Thumb Down but did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 56) = 18.41$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Boy icon and statistically significantly higher than the Thumb Down and No Children Under 18 icons, all ps < .0001, but did not differ statistically significantly from the Prohibit icon, $p > .05$. The Prohibit icon was statistically significantly lower than the Boy icon, $p < .05$ and statistically significantly higher than the Thumb Down and No Children Under 18 icons ps < .001. The Boy icon was statistically significantly higher than the Thumb Down and No Children Under 18 icons, ps < .0001. The Thumb Down did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message

3, $F(4, 56) = 65.16$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the rest of the icons, all $ps < .0001$. The Prohibit icon was statistically significantly lower than the Boy, Thumb Down, and the No Children Under 18 icons, $ps < .0001$. The Boy icon did not differ statistically significantly from the Thumb Down or the No Children Under 18 icons, $ps > .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$.

For the signal word WARNING in red a statistically significant difference in likelihood of avoidance was found among the three messages at Crying Baby icon, $F(2, 56) = 38.05$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of avoidance than message 2 and statistically significantly higher than message 3, $ps < .0001$. Message 2 was statistically significantly higher than message 3 $p < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Prohibitive icon, $F(2, 56) = 54.56$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and statistically significantly higher than message 3, $ps < .0001$. Message 2 was statistically significantly higher than message 3 $p < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Boy icon, $F(2, 56) = 38.36$, $p < .0001$ Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and statistically significantly higher than message 3, $ps < .0001$. Message 2 was statistically significantly higher than message 3 $p < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also

found at the Thumb Down icon, $F(2, 56) = 9.45$, $p < .0005$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and statistically significantly higher than message 3, $ps < .0001$. Message 2 was statistically significantly higher than message 3 $p < .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the No Children Under 18 icon, $F(2, 56) = 75.99$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all $ps < .0001$.

Statistically significant differences were also found in likelihood of avoidance among the five icons at message 1, $F(4, 56) = 33.72$, $p < .0001$. Range tests indicated that the Crying Baby icon was scored statistically significantly higher than the Thumb Down and No Children Under 18 icons, $ps < .0001$, but did not differ statistically significantly from the Prohibit and Boy icons, $ps > .05$. The Prohibit icon did not differ statistically significantly from the Boy icon, $p > .05$ and was statistically significantly higher than the Thumb Down and No Children Under 18 icons, $ps > .05$. The Boy was statistically significantly higher than the Thumb Down and the No Children Under 18 icons, $ps < .0001$. The Thumb Down icon was statistically significantly higher than the No Children Under 18 icon, $p < .0001$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 56) = 9.73$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the Thumb Down and No Children Under 18 icons, $ps < .001$, but did not differ statistically significantly from the Prohibit and Boy icons, $ps > .05$. The Prohibit icon did not differ statistically significantly from the Boy icon, $p > .05$ and was statistically significantly

higher than the Thumb Down and No Children Under 18 icons, ps , .001. The Boy icon

was statistically significantly higher than the Thumb Down and No Children Under 18

icons, ps < .0001. Statistically significant differences in likelihood of avoidance were

also found among the five icons at message 3, $F(4, 56) = 38.37$, $p < .0001$. Range tests

indicated that the Crying Baby icon was statistically significantly higher than the Prohibit

icon, $p < .05$, and statistically significantly lower than the Thumb Down and No Children

Under 18 icons, ps < .0001, but did not differ statistically significantly from the Boy

icons, $p > .05$. The Prohibit icon was statistically significantly lower than the Boy,

Thumb Down, and No Children Under 18 icons, ps < .01. The Boy icon was scored

statistically significantly lower than the Thumb Down and No Children Under 18 icons,

ps < .0001. The Thumb Down icon did not differ statistically significantly from the No

Children Under 18 icon, $p > .05$.

   For the signal word WARNING in black a statistically significant difference in

likelihood of avoidance was found among the three messages at Crying Baby icon, $F(2,$

$56) = 1307.10$, $p < .0001$. Range tests indicated that message 1 was statistically

significantly lower in likelihood of avoidance than message 2 and statistically

significantly higher than message 3, ps < .001. Message 2 was statistically significantly

higher than message 3, $p < .0001$. A statistically significant difference in likelihood of

avoidance among the three messages was also found at the Prohibitive icon, $F(2, 56) =$

1839.44, $p < .0001$. Range tests indicated that message 1 was statistically significantly

lower in likelihood of voidance than messages 2 and statistically significantly higher than

message 3, ps < .001. Message 2 was statistically significantly higher than message 3, p

< .0001. A statistically significant difference in likelihood of avoidance among the three

messages was also found at the Boy icon, $F(2, 56) = 619.34$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of voidance than messages 2 and 3 ps $< .0001$. Message 2 did not differ statistically significantly from message 3, $p > .05$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the Thumb Down icon, $F(2, 56) = 329.98$, $p < .0001$. Range tests indicated that message 1 was scored statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was statistically significantly lower than message 3, all ps $< .0001$. A statistically significant difference in likelihood of avoidance among the three messages was also found at the No Children Under 18 icon, $F(2, 56) = 187.23$, $p < .0001$. Range tests indicated that message 1 was statistically significantly lower in likelihood of voidance than messages 2 and 3, and message 2 was scored statistically significantly lower than message 3, all ps $< .0001$.

Statistically significant differences in likelihood of avoidance were also found among the five icons at message 1, $F(4, 56) = 208.67$, $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the rest of the icons, all ps $< .0001$. The Prohibit icon did not differ statistically significantly from the Boy, Thumb Down, and No Children Under 18 icons, all ps $> .05$. The Boy icon did not differ statistically significantly from the Thumb Down and No Children Under 18 icons, ps $> .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 2, $F(4, 56) = 483.00$ $p < .0001$. Range tests indicated that the Crying Baby icon was statistically significantly lower than the

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Prohibit icon and statistically significantly higher than the Boy, Thumb Down, and No Children Under 18 icons, $ps < .0001$. The Prohibit icon was statistically significantly higher than the Boy, Thumb Down, and No Children Under 18 icons, $ps < .0001$. The Boy icon did not differ statistically significantly from the Thumb Down and No Children Under 18 icons, $ps > .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$. Statistically significant differences in likelihood of avoidance were also found among the five icons at message 3, $F(4, 56) = 859.40$, $p < .0001$. Range tests indicated that the Crying Baby did not differ statistically significantly from the Prohibit icon, $p > .05$, but was scored statistically significantly lower than the Boy, Thumb Down, and No Children Under 18 icons, $ps < .0001$. The Prohibit icon was statistically significantly lower than the Boy Thumb Down, and No Children Under 18 icons, $ps < .0001$. The Boy icon did not differ statistically significantly from the Thumb Down and the No Children Under 18 icons, $ps > .05$. The Thumb Down icon did not differ statistically significantly from the No Children Under 18 icon, $p > .05$.

Likelihood of avoidance: color x signal word interaction.

Simple effects for the color x signal word interaction showed that there was no statistically significant difference between the word STOP in red and the word STOP in black, $F(1, 56) = .868$, $p > .05$. No statistically significant difference was found between the word WARNING in red and the word WARNING in black, $F(1, 56) = .196$, $p > .05$. The word STOP in red did not statistically significantly differ from the word WARNING in red, $F(1, 56) = 1.66$, $p > .05$. There was no statistically significant difference between

the word STOP in black was statistically significantly higher than the word WARNING

in black, $F(1, 56) = .007, p > .05$.

Results Summary

The main effects for icon and color were not statistically significant, when the control

condition was not included in the analyses. The main effect for signal word was

significant, indicating that the signal words STOP and WARNING did not differ un

understandability, but the word STOP was scored higher than the word WARNING in

likelihood of avoidance. The main effect of warning message was significant for both

understandability and likelihood of avoidance. For both variables message 1 (least

explicit message) was lower than messages 2 and 3, and message 2 was lower than

message 3 (most explicit message). All of the interactions except for the color x signal

word x warning message, and the icon x color were statistically significant.

Repeated Measures MANOVA – Control Condition Included, Collapsed Across

Color - Children

A second repeated measures (icon x signal word x message) MANOVA was

performed on the children's data. This MANOVA included data from the control

condition. The data were collapsed across color, to maintain a factorial design.

Main effects.

A statistically significant main effect was not found for icon $p = .185$. Statistically

significant main effects were found for signal word, $F(4, 30) = 11.79, p < .0001$, Wilks'

$\Lambda = .151$, partial $\eta^2 = .611$, and warning message, $F(6, 46) = 14.23, p < .0001$, Wilks' Λ

$= .123$, partial $\eta^2 = .650$.

Follow-up univariate analyses (Bonferroni correction α = .025) revealed that the main effect for signal word was statistically significant for understandability, $F(2, 16) = 22.66$, $p < .0001$, partial $\eta^2 = .739$, and was not statistically significant for likelihood of avoidance, $p > .05$. Subsequent range tests for understandability did not reveal any statistically significant differences among the control (no signal word) condition, STOP and WARNING, all ps $> .05$ (for means and standard deviations, see Table 25).

The main effect for warning message was statistically significant for understandability, $F(3, 24) = 22.08$, $p < .0001$, partial $\eta^2 = .732$, and likelihood of avoidance, $F(3, 24) = 8.60$, $p < .0001$, partial $\eta^2 = .518$. Follow-up Fisher-Hayter range tests for understandability showed that the control condition (no message) was statistically significantly lower in understandability than messages 1, 2, and 3, ps $< .0001$. No statistically significant differences were found among the other messages, $p > .05$. Range tests performed on the likelihood of avoidance means for the warning messages showed the control condition was scored statistically significantly lower than messages 1 and 2, ps $< .0001$, and did not statistically significantly differ from message 3, $p > .05$. Message 1 did not differ statistically significantly from messages 2 and 3, ps $> .05$, and message 2 was statistically significantly higher in likelihood of avoidance than message 3, $p < .001$ (for message means and standard deviations, see Table 26).

Interactions.

Statistically significant icon x signal word x warning message, $F(48, 382) = 2.15$, $p < .0001$, partial $\eta^2 = .213$; signal word x warning message, $F(12, 94) = 2.62$, $p < .01$, partial $\eta^2 = .251$; icon by warning message, $F(24, 190) = 5.44$, $p < .0001$, $\eta^2 = .407$; and icon x

signal word, $F(16, 126) = 1.77$, $p < .05$, partial $\eta^2 = .184$ interactions were found for the children's data when the control condition was included in the analyses.

A Bonferroni correction ($\alpha = .025$) was applied to all subsequent univariate analyses. Subsequent univariate analyses showed that the icon x signal word x warning message interaction was statistically significant for understandability, $F(24, 192) = 1.94$, $p < .01$, partial $\eta^2 = .196$, and likelihood of avoidance, $F(24, 192) = 2.14$, $p = .001$, $\eta^2 = .232$.

Follow up tests for the signal word x warning message interaction showed that the interaction was not statistically significant for understandability, $p > .05$, but was statistically significant for likelihood of avoidance, $F(6, 48) = 4.51$, $p = .001$, $\eta^2 = .375$.

Follow-up tests for the icon x warning message interaction showed that it was not statistically significant for understandability, $p > .05$, but was statistically significant for likelihood of avoidance $F(12, 96) = 33.72$, $p < .0001$, $\eta^2 = .580$.

Follow-up tests for the icon x signal word interaction showed that the interaction was statistically significant for understandability $F(8, 64) = 3.18$, $p < .01$, $\eta^2 = .037$, carefulness, $F(12, 2160) = 33.85$, $p < .0001$, $\eta^2 = .111$, likelihood of encountering danger, $F(12, 2160) = 21.81$, $p < .0001$, $\eta^2 = .075$, attention-getting, $F(12, 2160) = 73.04$, $p = .0001$, $\eta^2 = .260$, but not likelihood of avoidance, $p > .05$.

Tests of simple effects and range tests for statistically significant interactions.

Understandability: icon x signal word x warning message interaction.

For this interaction simple effect were performed for signal word and warning message at each icon. For the Crying Baby icon, there were statistically significant differences among the three signal word conditions at the control (no message), $F(2, 192) = 13.40$, $p < .0001$, and message 1, $F(2, 192) = 9.78$, $p = .001$ conditions, but not at

message 2 or message 3 ps > .05. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001 and STOP and WARNING did not differ statistically significantly from each other, p > .05. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps < .0001 and STOP and WARNING did not differ statistically significantly from each other, p > .05.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 22.41$, $p < .0001$, STOP $F(3, 192) = 3.47$, $p < .05$, and WARNING, $F(3, 192) = 5.17$, $p < .01$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 2, and 3, ps < .0001, but did not differ statistically significantly from message 1, p > .05. Message 1 was scored statistically significantly lower than messages 2 and 3, ps < .001, and message 2 did not differ statistically significantly from message 3, p > .05. At signal word STOP control (no warning message) was scored statistically significantly lower than message 3 $p < .001$. No statistically significant differences were found among the other messages, all ps > .05. At signal word WARNING, control (no warning message) was scored statistically significantly lower than message 3, $p < .001$, but did not differ statistically significantly from any other messages, all ps > .05. Message 1 was scored statistically significantly lower than message 3, $p < .01$, but did not differ statistically significantly from the other messages, ps > .05. There was no difference between messages 2 and 3, p > .05.

For the Prohibit icon there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 192) = 7.52$, $p < .0001$, however, no statistically significant differences among signal word conditions were found at messages 1, 2, *or* 3, all *p*s > .05. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly higher than WARNING, $p < .001$, but did not statistically significantly differ from the word STOP, $p > .05$.

Statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 3.21$, $p < .05$, STOP $F(3, 192) = 11.43$, $p < .0001$, and WARNING, $F(3, 192) = 17.81$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than message 2, $p < .05$. No other statistically significant differences were found among the messages, all *p*s > .05. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001. Message 1 was did not differ statistically significantly from messages 2 and 3, *p*s > .05, and message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all *p*s < .0001. Message 1 did not differ statistically significantly from messages 2 and 3, *p*s > .05, and message 2 did not differ statistically significantly from message 3, $p > .05$.

For the Boy icon there were statistically significant differences among the three signal word conditions at the control (no warning message) condition, $F(2, 192) = 3.91$, $p < .05$, message 1, $F(2, 192) = 4.41$, $p < .05$, but not at message 2 or message 3, *p*s > .05. Range

tests showed that at the control (no warning message) condition, the control (no signal word) condition did not differ statistically significantly from STOP or WARNING, $ps > .05$, and STOP was statistically significantly higher than WARNING, $p < .01$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP did not differ statistically significantly from WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 9.98$, $p < .0001$, STOP $F(3, 192) = 8.85$, $p < .0001$, and WARNING, $F(3, 192) = 20.39$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 2 and 3, $ps < .01$, but did not differ statistically significantly from message1. At signal word STOP control (no warning message) was scored statistically significantly lower than messages 1, 2, and 3, all $ps < .01$. No statistically significant differences were found between the other messages, all $ps > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. No statistically significant differences were found between the other messages, all $ps > .05$.

For the Thumb Down icon there were statistically significant differences among the three signal word conditions at the control (no warning message) condition, $F(2, 6480) = 112.34$, $p < .0001$, message 1, $F(2, 6480) = 31.26$, $p < .0001$, message 2, $F(2, 6480) = 66.72$, $p < .0005$, and message 3, $F(2, 6480) = 35.14$, $p < .0001$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was

statistically significantly higher than WARNING, $p < .0001$. At message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly higher than WARNING, $p < .0001$. At message 2, the control (no signal word) condition was scored statistically significantly lower than STOP and WARNING, $ps < .0001$, and STOP was statistically significantly lower than WARNING, $p < .0001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .0001$, however, STOP and WARNING did not differ statistically significantly from each other, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 8.15$, $p < .0001$, STOP $F(3, 192) = 11.50$, $p < .0001$, and WARNING, $F(3, 192) = 12.41$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. No other statistically significant differences were found among the messages, all $ps > .05$ At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 3, $p < .001$, but did not differ statistically significantly from message 2, $p > .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 3, $p < .001$, but did not differ statistically significantly from

message 2, $p > .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$.

For the No Children Under 18 icon, no statistically significant differences were found among the three signal word conditions at the control (no warning message) condition, message 1, 2, or 3, all $ps > .05$.

Statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 8.11$, $p < .0001$, STOP $F(3, 192) = 11.51$, $p < .0001$, and WARNING, $F(3, 192) = 11.99$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than message 3, $p < .0001$, but did not differ statistically significantly from message 3, $p > .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. No statistically significant differences were found among the other messages, all $ps > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .001$, and message 2 did not differ statistically significantly from message 3, $p > .05$.

Likelihood of avoidance: icon x signal word x warning message interaction.

For the Crying Baby icon, no statistically significant differences among the three signal word conditions were found at the control (no message), message 1, message 2, or message 3 conditions, all $ps > .05$

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Statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 17.61$, $p < .0001$, STOP $F(3, 192) = 28.97$, $p < .0001$, and WARNING, $F(3, 192) = 11.13$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1 and 2, and statistically significantly higher than message 3, all ps $< .001$. Message 1 did not differ statistically significantly from messages 2 and 3, ps $> .05$. Message 2 was statistically significantly higher than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and statistically significantly higher than message 3, all ps $< .001$. Message 1 did not differ statistically significantly from message 2, $p > .05$, and was scored statistically significantly higher than message 2, $p < .001$. Message 2 was statistically significantly higher than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was statistically significantly lower than message 2 $p < .0001$, but did not differ statistically significantly from messages 2 and 3, ps $> .05$. Message 1 was statistically significantly lower than messages 2, $p < .0001$, but did not differ statistically significantly from message 3, $p > .05$. Message 2 was statistically significantly higher than message 3, $p < .0001$.

For the Prohibit icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 192) = 6.67$, $p < .01$, but not at messages 1, 2, or 3, all ps $> .05$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly higher than STOP, $p < .01$, but did not statistically significantly differ from WARNING, $p > .05$. STOP and WARNING did not differ statistically significantly from

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one another, $p > .05$, however, there was no statistically significant difference between the signal words STOP and WARNING, $p > .05$

Statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 21.94$, $p < .0001$, STOP $F(3, 192) = 16.14$, $p < .0001$, and WARNING, $F(3, 192) = 18.97$, $p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than message 2, and statistically significantly higher than message 3, ps $< .05$, but did not differ statistically significantly from message 1, $p > .05$. Message 1 did not differ statistically significantly from message 2, $p > .05$ and was statistically significantly higher than message 3, $p < .0001$. Message 2 was statistically significantly higher than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1 and 2, ps $< .01$, and statistically significantly higher than message 3, $p < .01$. Message 1 did not differ statistically significantly from message 2, $p > .05$ and was statistically significantly higher than message 3, $p < .01$, and message 2 was statistically significantly higher than message 3, $p < .0001$. At signal word WARNING, control (no warning message) was scored statistically significantly lower than messages 1 and 2, ps $< .0001$, and did not statistically significantly differ from message 3, $p > .05$. Message 1 was scored statistically significantly lower than messages 2, $p < .05$ and statistically significantly higher than message 3, $p < .0001$, and message 2 was statistically significantly higher than message 3, $p < .0001$.

For the Boy icon, there were statistically significant differences among the three signal word conditions at the control (no message) condition, $F(2, 192) = 3.98$, $p < .05$,

message 2, $F(2, 192) = 3.79$, $p < .05$, and message 3, $F(2, 192) = 3.84$, $p < .05$, but not at message 1, $p > .05$. Range tests showed that at the control (no warning message) condition, the control (no signal word) condition was statistically significantly higher than STOP, $p < .05$, but did not differ statistically significantly from WARNING, $p > .05$. The word STOP was statistically significantly lower than WARNING, $p < .05$. At message 2, the control (no signal word) condition was statistically significantly higher than WARNING, $p < .01$, but did not differ statistically significantly from STOP, $p > .05$. STOP was statistically significantly higher than WARNING, $p < .001$. At message 3, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, ps $< .05$. However, no statistically significant difference was found between STOP and WARNING, $p > .05$.

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 20.99$, $p < .0001$, STOP $F(3, 192) = 26.37$, $p < .0001$, and WARNING, $F(3, 192) = 5.95$, $p < .001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1 and 2, ps $< .0001$, but did not differ statistically significantly from message 3, $p > .05$. Message 1 was statistically significantly lower than message 2, $p < .001$ and statistically significantly higher than message 3, $p < .0001$. Message 2 was statistically significantly higher than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1 and2, and 3, all ps $< .0001$. Message 1 was statistically significantly lower than message 2 $p < .001$, but did not differ statistically significantly from message 3, $p > .05$. Message 2 was statistically significantly higher

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than message 3, $p < .001$. At signal word WARNING, control (no warning message) was statistically significantly lower than message 2 $p < .01$, but did not differ statistically significantly from messages 1 or 3, ps $> .05$. Message 1 did not differ statistically significantly from messages 2 and 3, ps $> .05$. Message 2 was statistically significantly higher than message 3, $p < .01$.

For the Thumb Down icon, no statistically significant differences among the three signal word conditions at the control (no message) condition, message 1, message 2, or message 3, ps $> .05$.

Statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 5.94$, $p < .001$, STOP $F(3, 192) = 9.16$, $p < .0001$, and WARNING, $F(3, 192) = 7.48.99$, $p < .001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .05$. Message 1 did not statistically significantly differ from message 2, $p > .05$ and was statistically significantly lower than message 3, $p < .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .01$. Message 1 was statistically significantly lower than messages 3, $p < .01$, but did not differ statistically significantly from message 3, $p > .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all ps $< .01$. Message 1 did not differ statistically significantly from messages 2 and 3, ps $> .05$, and message 2 did not differ statistically significantly from message 3, $p > .05$.

For the No Children Under 18 icon, there were statistically significant differences among the three signal word conditions at message 1, $F(2, 192) = 8.17, p < .01$, but not at the control (no message) condition, message 2, or message 3, all $ps > .05$. Range tests showed that at message 1, the control (no signal word) condition was statistically significantly lower than STOP and WARNING, $ps < .001$, but the word STOP did not differ statistically significantly from WARNING, $p > .05$

Likewise, statistically significant differences were found among the four message conditions at the control (no signal word) condition, $F(3, 192) = 6.15, p < .001$, STOP $F(3, 192) = 4.75, p < .01$, and WARNING, $F(3, 192) = 8.78, p < .0001$. Range tests showed that at the control (no signal word), control (no warning message) was statistically significantly lower than messages 1, 2, and 3, all $ps < .0001$. Message 1 did not statistically significantly differ from message 2, $p > .05$ and was statistically significantly lower than message 3, $p < .0001$. Message 2 was statistically significantly lower than message 3, $p < .0001$. At signal word STOP control (no warning message) was statistically significantly lower than messages 1 and 3, $ps < .01$, but did not differ statistically significantly from message 2, $p > .05$. Message 1 did not statistically significantly differ from messages 2 and 3 $p > .05$. Message 2 did not differ statistically significantly from message 3, $p > .05$. At signal word WARNING, control (no warning message) was statistically significantly lower than messages 2 and 3, all $ps < .0001$, but did not differ statistically significantly from message 1, $p > .01$. Message 1 was statistically significantly lower than messages 2 and 3, $ps < .0001$, and message 2 was scored statistically significantly lower than message 3, $p < .05$.

Results Summary

No main effect was found for icon. Statistically significant main effects were found for signal word (understandability only) and warning message (for understandability and likelihood of avoidance). For signal word, however, subsequent tests did not reveal statistically significant differences among the control condition, STOP, and WARNING. Concerning the warning message condition, the control (no message) condition was scored lower than the messages 1, 2, and 3 in understandability. In likelihood of avoidance, whoever, the control condition was scored significantly lower than messages 1 and 2, but did not differ from message 3. Statistically significant icon x signal word x warning message, signal word x warning message, icon by warning message, and icon x signal word, interactions were found for the children's data when the control condition was included in the analyses.

CHAPTER 4

DISCUSSION

Study 1

Statistically significant differences on most dependent variables were found for the

familiarity, abstractness, and prohibitiveness hypotheses. The results for these

hypotheses were similar for both children and adults.

Icons With Meaning is Known vs. Meaning Unknown

Overall, icons whose meaning is known did not differ statistically significantly from

icons whose meaning was not known. The only statistically significant difference

between these two categories was found for the minors' likelihood of avoidance variable.

Because most of the icons in this study had not been used or tested previously, there may

not be a clearly defined difference between the two categories. Most existing literature

on warning pictorials lacks studies that involve the examination of icons with known and

unknown meanings. Thus, it is difficult to interpret this finding. In fact, a study by

Mazzae and Ranney, 2001 showed that when familiar automotive tire underinflation

icons, that were developed by ISO and currently used in automobiles, were compared to

alternative tire pressure icons developed by the authors, most of the proposed icons were

rated higher in comprehension than the original icons developed by ISO, showing that

icons whose meaning is already known by end-users may not always be the best choice

for concept representation.

Another issue to consider about the meaning of icons is one of the relationship

between icon meaning and an icon's *semantic distance* (Isherwood, McDougall, & Curry,

2007; McDougall, Curry, & deBruijn, 1999). An icon's semantic distance is a

measurement of the icon-function relationship and is usually considered alongside meaning in research. Semantic distance is usually measured in one of three ways: 1) icon - a close relationship between icon and its intended function (e.g. picture of a keyboard means "the keyboard is here" or "type here"), 2) index- use of inference to extract meaning (e.g. a picture of a soccer ball to imply "wear for sports activities" or "for sports use only"), and 3) symbol - and arbitrary relationship between the icon and its function where the end-users must have experience with a given icon in order to interpret it correctly (e.g. means "floating air vent"). Research showed that meaningfulness influences comprehensibility, especially in the instance when a pictorial can be classified as an icon or a symbol (Isherwood et al., 2007). When images and their intended meanings are not closely related to one another, the comprehensibility of an image is affected. Meaningfulness of an icon also depends on context. Because icons were tested by themselves without signal words, messages, or cues as to the intended meaning of the icon, the intended meaning of the icon may have been less comprehensible.

Schröeder and Ziefle (2008) examined the differences in younger (19 – 29 years old) and older (55 – 65 years old) adults in terms of their response time and degree of semantic relatedness measures for a set of abstract simple, abstract complex, concrete simple, and concrete complex icons. Although there was no statistically significant difference between younger and older participants in semantic relatedness of icons, the younger participants scored icons higher than older adults on semantic relatedness. This may explain the finding that younger participants were more likely to avoid icons whose meaning they know than those whose meaning they do not know.

In general, these icons need to be re-examined using semantic distance and meaning and tested again with a larger sample of children.

Familiar vs. Unfamiliar Icons

Icons that were classified as "familiar" were rated higher than icons that were classified as "unfamiliar" for understandability, attention-getting, carefulness, likelihood and severity of danger, but not for likelihood of avoidance, among adults. The same results were found for children for the understandability and likelihood of avoidance variables. These findings are supported by the warnings literature (Bzostek and Wogalter, 1999; Isherwood, McDougall, & Curry, 2007; Mazzae & Ranney, 2001). Generally, symbols that have been considered familiar have been ones that are encountered with a higher frequency (McDougall et al., 1999; 2000). Previous research has shown that pictorials which are familiar (i.e., those that participants have previously seen) were found to be more comprehensible (Silver & Perlotto, 1997) and contribute to a reduced visual search for a warning (Bzostek & Wogalter, 1999). Care must be taken, however, in applying the results of previous studies to this particular research project. Previous research included icons that have been developed for use on medication containers and airline in-flight safety cards. Thus, these images have intent to warn of a potential negative consequence. In the present study, however, icons that were classified as familiar were images that were commonly seen in the environment, not necessarily ones that are commonly used as icons in warnings. For example, an image of a police car (icon #s 24 and 25, see Appendix A) were classified as familiar because they are commonly seen in the environment along with an icon of an exclamation point surrounded by a triangle (icon #14), because the latter is a common image used in

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warnings. Icons that were classified as "unfamiliar" were images that were not only commonly seen in the environment but also have never been used in warnings. Furthermore, many of the icons that were classified as "familiar" were also images that are prohibitive in nature (e.g., icon #s 21, 23, 24, 25) and generally, prohibitive images are understood better than images that do not have a prohibitive component (Ringseis & Caird, 1995). Because prohibitive icons may contribute to the increased comprehension of icons that were classified as "familiar" in the present study, it is necessary to test the icons classified as "familiar" in the present study against other commonly used icons for differences in comprehension and other variables.

In addition to classification, the complexity of the icons must be considered when interpreting understandability and attention-getting properties. Reppa, Playfoot, and McDougall (2008) found that complex icons took longer to notice than simple icons and that familiarity with complex icons did not attenuate the time that it took to notice the icon. Another important finding by the authors concerned the aesthetic appeal of the icons. The authors found that simple appealing icons did not differ from one another statistically significantly in their noticeability; however, there was a statistically significant difference between complex appealing and unappealing icons, where complex appealing icons were found faster than simple appealing icons. This finding may be statistically significant to the results of the present study in that most of the icons tested here can be considered to be complex and appealing if measured by the rubric used in the Reppa, et.al., (2008) study. However, some research suggests that icon components (e.g., color, semantic information in an icon) contribute to the meaning of the icon and a well-constructed icon will be understood regardless of its familiarity level (Isherwood,

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Laughery & Wogalter, 2006; McDougall, & Curry, 2007; Nakata, Campbell, & Richman, 2002).

Abstract vs. Concrete Icons

Abstract icons were scored statistically significantly higher than concrete icons on the severity of danger and the likelihood of encountering danger. However, abstract and concrete icons did not differ statistically significantly on any other dependent measures for adults. Children did not score abstract and concrete icons differently in understandability, but scored abstract icons statistically significantly higher in likelihood of avoidance. This finding contradicts the previous findings in the literature (Isherwood, et al., 2007; McDougall, et al., 1999; 2000). This contradiction, however, may be explained by several factors. One of the factors that can explain the lack of statistically significant differences on most dependent variables in the present study is the rubric used to classify icons into abstract and concrete. Because most icons in this study were novel (i.e., developed for this particular research project and not used previously), a criteria needed to be established for classifying the images into "abstract" and "concrete". The abstract/concrete classification rubric that was used in the present study was developed by Garcia, et al. (1994). The authors suggested that the measure of an icon's abstractness is determined by adding up the icon's components in each icon and producing a score (see Table 1 for icon components). The presence of each of the components is scored as one point. The authors found that icons with less components (up to 10) were perceived as more concrete and icons with a larger number of components as more abstract. Following this metric, the icons in the present study were likewise classified according to the number of components. This provided an objective classification measure, without

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the use of subjective rating techniques. The majority of the studies on abstract vs. concrete images in the warnings literature, however, have not utilized the Garcia et al. (1994) rubric to classify icons into abstract and concrete categories. As an unofficial rule of thumb in warnings research, abstract and concrete icons are classified according to the meaning of the information contained in the pictorial and how closely it represents the message or procedure that it is meant to convey. For example, Ringseis and Caird (1995), found that of twenty pharmaceutical pictograms, the ones best understood were most relevant to the message that the pictorial was trying to convey (i.e., a martini glass with an X through it was more likely to be interpreted as "do not take with alcohol" or "do not drink while taking medication" than a pictorial of a car interpreted as "may impair driving"). Another study (Silver, et al, 1995) examined the comprehension and perceived quality of common environmental warning pictorials such as "Do Not Enter", "Electrical Shock", and "Do Not Dig". They found that pictorials conveying the message in a more concrete way were scored higher in quality and comprehensibility than pictorials that conveyed the message in an abstract way (i.e., the "Shout" pictorial was rated higher than the Do Not Enter DOT sign, see Figure 37 below). The Silver, et al. (1995) work demonstrated the divergence of the Garcia et al. (1994) abstractness metric used in the present study from the more general classification of abstractness in the warnings literature. According to the Garcia et al. (1994) classification, the "Do Not Enter" DOT icon would be considered a concrete icon, similar to icon #9 (⊘) in the present study. However, according to the convention that abstract icons are those that do not directly represent concepts that they are trying to communicate. Thus, this icon as well as the "Shout" icon from Silver et al., 1995 would be considered abstract. It is for

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these reasons that the interpretation of the abstract vs. concrete hypothesis results in the present study is challenging. The classification of icons in this study was made using a rubric that does not follow the practiced

Figure 37. Icons similar to Silver, Wogalter, Brewster, Glover, Murray, Tillotson, and Temple (1995). a) "The Shout" Do Not Enter Pictorial, b) "Do Not Enter" DOT pictorial.

pattern of abstract / concrete icon classification. This means that some of the icons that were classified as abstract in the present study may in fact, be considered concrete (e.g., icon #s 31 and 33). Further investigation is necessary to examine the proposed icons after re-classifying them into abstract and concrete categories according to the concepts they represent and their degree of relationship to the intended message rather examining the number of components for each icon.

Prohibitive vs. Non-Prohibitive Icons

One of the main goals of a warning is to influence people's behavior and to increase safety (Wogalter, 2006a). Therefore, if a warning's intent is to keep individuals away from a potentially harmful situation, it must be prohibitive enough to communicate danger, or at least a sufficient amount of risk as a consequence of non-avoidance. In the present study, icons that were classified as prohibitive were rated higher in understandability, carefulness, likelihood of avoidance, and familiarity, but not attention-

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getting or likelihood or severity of danger. The minor participants rated prohibitive icons higher in both understandability and likelihood of avoidance than non-prohibitive icons.

Past research has shown that icons that are prohibitive or have prohibitive features , for example a slash (/) or an X through an image are rated higher in comprehension and quality than icons that do not have a prohibitive component (see Ringseis & Caird, 1995; Silver et al., 1995; 1998). It was likewise expected that prohibitive icons would be rated higher in the likelihood of avoidance, carefulness, and familiarity. A warning is more commonly a prohibitive statement rather than an informative one. Thus, it was expected that most environmental are more prohibitive in nature. Prohibitive icons are more likely to influence avoidance behavior than non-prohibitive icons because they are better understood and communicate appropriate behavior (i.e., stay away, do not enter, etc.). It is not surprising to find that prohibitive icons did not differ from non-prohibitive icons in terms of their attention-getting properties, because prohibitive symbols in icons do not contribute to the noticeability of a warning image. Other factors such as placement, context, and semantic information have a greater effect on whether and how quickly a warning pictorial is noticed (Forsythe, Sheehy, & Sawey, 2004; Isherwood, et al, 2007).

Making a Better Pictorial

Designing effective warnings pictorials is an art and a science. The first study in the current research project provides several considerations for making better pictorials, especially those designed for children. Increased noticeability of warnings with addition of graphic pictorials has been documented in research and suggested by warnings experts (Hammond, et al., 2006; Laughery & Wogalter, 2006). Some of the more salient factors in icon construction are the concreteness / abstractness of the icon, the placement of the

icon within the warning, and the semantic distance of the icon. Other factors that may

have an influence on the icon's effectiveness are its color and aesthetic appeal.

Overall, concrete images are scored higher in comprehensibility (Silver, et al., 1995)

and have lower reaction times (Murata and Furukawa, 2005). The semantic distance of a

pictorial, and therefore the intended audience must be considered (Isherwood,

McDougall, & Curry, 2007). As pointed out in previous research, least understandable

pictorials are those that require the greatest amount of inference on the part of the end-

user as they communicate the referent function of the pictorial poorly. In the case of

warnings that are targeted at minors on the Internet, however, there is a limited array of

concrete pictorial options and the icons used in this setting must be able to communicate

complex concepts in a concise manner. This is a difficult goal to accomplish as complex

concepts represented by icons are not well understood by end users in icons. For

example, in a study of prescription pharmaceutical labels by Navai, et al., 2001, the

authors found that concepts such as time (e.g., "take every four hours") and compound

instructions in a single pictorial (e.g., take 1 two times a day for seven days with plenty of

water) were poorly understood by participants. In the case of complex functions implied
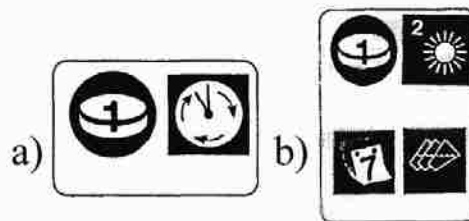
by icons paired

Figure 38. Example pictorials similar to Navai et.al, 2001 study. a) "Take 1 every four

hours", b) "Take 1, 3 Times a Day for Seven Days with Plenty of Water.

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with an audience that is not familiar with the icon's intended function, including semantic information in icons may benefit the end-user. Although Forsythe et al, (2004) found that when icons were presented to participants with semantic and non-semantic distracters, semantic processing interfered with search times for the target icon, whereas, other studies have shown that adding familiar semantic component to icons, such as an "X" for time (e.g., "4X" to indicate "four times") increases comprehension of icons without accompanying instructions (Navai, et al., 2001.) In fact, one of the highest scored icons in this study on all dependent variables was icon # 34, which includes a prohibitive circle with a slash around a face with the numbers 0-18. The inclusion of semantic features in the icon allows one to interpret the intended function of the icon correctly as "no children under 18". If the "0-18" component of the icon were excluded, it may be more difficult for the end-user to infer that this icon's function is meant to prohibit children under 18 years of age, since they would be required to make an inference about the face in the icon.

Study 2

At the time of the conceptualization of the second study in this research project, it was not known which of the thirty-eight images from Study 1 will be used in this study. For this reason, the hypotheses for this study were limited to the variables which had previously been explored in the literature. For the purposes of a comprehensive discussion of results, result findings about each component of the warning will be discussed separately and overall findings will be addressed in the general discussion.

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Icon

A statistically significant main effect for icon was found in the second study overall and for each dependent variable. Although this main effect was statistically significant overall for the adults, the only icon that differed statistically significantly from the other icons was the Crying Baby ( ) icon. It was statistically significantly lower overall than the other icons. The Crying Baby icon is the only image tested in the second study that is not prohibitive. Prohibitive images increase warning compliance and are more comprehensible than non-prohibitive images (see Ringseis & Caird, 1995; Silver et al., 1995; and Silver et al., 1998). This finding is also more in-line with the abstract/concrete icon classification practices in human factors research. Yet, according to the Garcìa et al, (1994) classification rubric used in this study, the Prohibit ( ) and No Children Under 18 ( ) icons were classified as concrete, whereas the Boy ( ) and the Thumb Down ( ) icons were classified as abstract. According to the more commonly accepted idea that icons closely associated with their intended function are found to be more comprehensible, the Prohibit, Boy, Thumb Down, and No Children under 18 icons picture their intended function, which is generally "No" or "Do Not", whereas the Crying Baby icon requires a greater amount of inference from the end-user to figure out its intended message. Thus, it is not surprising that the Crying Baby icon was scored lowest on all dependent variables and the other four icons did not differ statistically significantly from one another overall.

It is worth mentioning here that although the main effect for icon for children was not statistically significant in this study, the Boy icon was scored higher than the rest by

children on both understandability and likelihood of avoidance. The number of child participants for this study was very low, contributing to a lack of power, hence it is not possible to make substantive conclusion. However, the possibility that picturing children in warning pictorials targeted at children is worth exploring in the future.

Signal Word Color

The main effect for signal word color was statistically significant for adults on understandability, carefulness, likelihood of encountering danger, attention-getting, but not for likelihood of avoidance; but there was no statistically significant main effect for children. Signal words printed in red were scored higher on all dependent variables (where a statistically significant result was found) than signal words printed in black. Although findings about color have been somewhat contradictory, this finding has been well-documented in the warnings literature. The color red has been shown to communicate the highest level of hazard by several researchers in the general, across different cultures, and with populations who come into contact with industrial warnings (Breshnahan & Bryk, 1975; Braun & Silver, 1995; Dunlap, Granada, & Kustas, 1986); although this finding has also been contradicted in the literature (Chapanis, 1994; Leonard, et al., 1986). Because color is used to augment the noticeability and perceived hazard of signal words, it was important to look at the interaction of color, signal word, and warning message to make conclusions about the best practices for warnings designed to target children. The fact that no statistically significant differences were found for the color variable among children may be explained by the small sample of participants (power ranged from .338 to .546) and will need to be examined further with a larger sample.

Signal Word

Signal words in warnings are intended to communicate a degree of danger and to imply a certain level of hazard severity (Frantz, Rhoades, Shah, Hall, Isaacson, & Burhans, 2005). They have been tested on their communicative properties and perceived level of hazard. Previous research on commonly used signal words has delineated high-, moderate-, and low-level hazard words (Wogalter & Silver, 1990; 1995). It has been suggested that this categorization of signal words is necessary because signal words need to be matched to their referent amount of hazard (Hellier, et al., 2007) because a well-matched signal word-hazard relationship makes a better, more effective warning (Edworthy & Adams, 1996; Wogalter & Silver, 1995). However, in an effort to measure the amount of hazard that signal words communicate, researchers have not spent much time examining other properties of signal words, such as likelihood of avoidance and carefulness.

Generally, signal words STOP and DANGER have been found to communicate a higher level of hazard than the word WARNING (Braun and Silver, 1995), which has been found to communicate a moderate level of hazard, although these results have been contradictory (Braun, et al., 1995; Braun & Shaver, 1999; Leonard, et al., 1986; Silver & Wogalter, 1991; Ursic, 1984; Wogalter & Silver, 1995). At the design stage of the present experiment, it was decided that the words STOP and WARNING would be best matched to the goals of the warnings to be tested in the course of the experiment. Because the goal of the warnings that were tested here is to prevent minors' access to potentially harmful and illegal content, the word STOP is the most appropriate of signal words for this purpose followed by the word WARNING.

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The main effect for signal word was statistically significant for both adult and children participants. For the adult participants, the main effect was statistically significant only for the understandability and likelihood of avoidance variables in which the signal word STOP was scored higher than WARNING. However, when the control condition (no signal word) was added to the analyses, the control condition was scored statistically significantly lower than STOP and WARNING on all dependent variables, but the two signal words did not differ statistically significantly from one another. For the minor participants, the main effect for signal word was not statistically significant for understandability, but the word STOP was scored higher for likelihood of avoidance. A puzzling result was the finding that the control (no signal word) condition did not differ statistically significantly from the words STOP and WARNING in understandability or likelihood of avoidance. This may be explained by several factors. The most obvious factor would be the lack of power resulting from the small number of child participants in the second study. Another factor may be that the effect of icon or warning message overshadowed the effect of signal word given a low number of participants. This finding should be explored in future research with a higher number of participants and children of a larger age range.

Warning Message

A well-written, concise warning message is important to the communicative, preventive, and educational properties of a warning. In the present study, four warning message conditions were tested with participants. The first (control) condition contained no warning. In the second condition, the warning was "This is illegal." Additional information was added to this warning in subsequent conditions, making the warnings

progressively more severe in consequence (i.e., "This is illegal. Your IP address may be monitored." and "This is illegal. Your IP address may be monitored and the police may be called.").

Research in the area of warnings is somewhat limited when it comes to the warning message or product instructions. Instead, past research has focused on the more immediately noticeable features of the warning such as icon and signal word. Some studies have shown that explicitness of warning message instructions does not have an effect on warning compliance or hazard perception. For example, Frantz (1994) presented instructions to participants that contained only procedural information (e.g., "Keep away from open flame or spark.") and were varied in the explicitness of instruction, but did not contain any information about non-compliance consequence. The author did not find differences in hazard perception based on the degree of action explicitness specified in the warning. However, the available research has demonstrated that adding a consequence to the warning message increased the likelihood of behavioral compliance. Braun, et al. (1995) presented consequences of non-compliance to participants along with product use instructions. The authors found that mean likelihood of injury scores were highest in conditions where consequences and actions were presented together as opposed to action only or repeat warning instructions. Stevens and Dingus (2001) found a difference in risk perception among men and women when testing risk perception, where women had higher perceptions of risk than men in a scenario regarding the use of booster seats in vehicles. Conversely, the males in the study indicated that higher fines should be assigned for booster seat use violations, indicating than males have a stronger punishment orientation. Moreover, adding a consequence to

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warning instructions may have a mediating effect on hazard perception. That is, adding a consequence increases the perception of hazard if the instructed behavior is not followed. At the design stage of this study, this logic was applied to designing the warning messages that were tested here. The present results support the Braun et.al, (1995) findings that adults rated messages with more severe consequences higher among all dependent variables than messages that did not contain consequences. In fact, for the carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance, the message with the most information and consequences ("This is illegal. Your IP address may be monitored and the police may be called.") was scored higher than the message with less consequences ("This is illegal. Your IP address may be monitored"); which, in turn, was scored higher on than the message that just contained information about the activity ("This is illegal"). Interestingly, for the adult participants, the most explicit message was scored highest in understandability, and all other message conditions did not differ from one another. This may be explained by the participants' perception of the items in the study. Because each dependent variable was measured with only one question (e.g., "How understandable is this warning", "How careful would you be after seeing this warning?"), participants may have perceived understandability to mean how well do they understand what the consequences are that the warning is trying to communicate as opposed to how well they understand what the warning says.

A particularly interesting finding in terms of warning messages was one that was found for the child participants. The results for understandability among minor participants were expected and similar to those for the adults; that is, the control condition was scored lower than any of the conditions that contained warning messages

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and no differences were found among the message conditions. However, for the likelihood of avoidance variable, the control condition (no message) was scored statistically significantly lower than the first two message conditions, but statistically significantly higher than the third, most explicit message condition ("This is illegal. Your IP address may be monitored and the police may be called."). Although the first message did not differ statistically significantly in likelihood of avoidance from the second and third (more explicit messages); the second warning message ("This is illegal. Your IP address may be monitored.") was rated higher in likelihood of avoidance than the third, most sever massage and for the Crying Baby and Prohibit icons, lower than the control condition. Certainly, with a low number of participants, caution must be used when interpreting any statistical results. Nonetheless, a statistically significant difference was found among the four message conditions for minor participants. This difference may be explained in terms of a few factors that may contribute to the result.

One of the simpler explanations that can be offered for this result is the issue of brevity. Brevity of warning messages has been discussed, researched and recommended in the warnings literature (Wogalter & Young, 1994). The take-home message of research on brevity is that in order to motivate end-users to behave in a way suggested by the warning, warning messages should be brief (Kim, Cowley, & Wogalter, 2007). Because the third message is less brief than the other two, it may have been rated less understandable. Although plausible, this explanation is unlikely, since this result was not found in adults and all messages were rated for their Flesch-Kincaid grade level and Flesch reading indices and were no higher than the grade level of 5.2. The most likely explanation for this finding is in the different ways that minors and adults perceive

danger and consequences. Although the two samples' mean ages were not very different (20-years-old vs. 14-years-old), developmentally, the difference may be enough to account for this finding in the rating of warning messages for likelihood of encountering danger.

According to the developmental literature, adolescents construct personal fables, which include themes of *invulnerability* (i.e., they are not capable of being harmed), *omnipotence* (i.e., viewing themselves as a source of special authority or having special powers), and *personal uniqueness* (i.e., feelings that no one understands them) (Elkind, 1967). Elkind's theory has been used as a framework for understanding the risk perception and evaluation of adolescents as well as their risk-taking behavior (Lapsley, 1993). According to the personal fable view of development, adolescents have an inflated sense of personal uniqueness, a sense of invulnerability in the face of authority, illness, and general risk, and experience feelings of being somehow special and different from everyone else (Goosens, Beyers, Emmen, & vanAken, 2002; Lapsley, FitzGerald, Rice, & Jackson, 1989). This framework of understanding adolescent thinking and behavior can likewise be applied to the results of their ratings of the warning messages. The warning message that mentions that the police may be called was rated lower in the likelihood of avoidance by minor participants than the warning message that mentioned that their IP address may be monitored. Seemingly, the mention of police elicits a reaction on invincibility in minors. Alternately, the police may not be an appropriate authority figure for minors of the particular age as participated in this study. These messages need to be examined using different authority sources (e.g., "your parents",

"your school") to find out whether there are differences in avoidance behavior among minors.

Another explanation for this result may be that minors simply do not believe this message. Since most of today's teens are fairly technologically savvy and have at least a basic if not an advanced understanding of the Internet and computer technology (Burnett & Wilkinson, 2005; Lenhart & Madden, 2007; Livingstone, 2003), the recording of their IP address may be plausible, but when the warning message informs that the police may be called, it loses believability. Because the warning message is the only component of the warning that include content that requires longer reading and processing time and which required a judgment of believability to be made by the end-user, this effect may not be seen in the results for the icon or the signal word.

Additionally, adult participants may have a different reaction to the police as an authority and in terms of consequence. Adults and minors are viewed and treated differently by the judicial systems, therefore, calling the police may pose a more serious threat to an adult than to a minor.

Some interactions were also observed in the present study for both adults and minors. Since interactions provide more information than main effects about the relationships between variables, the more meaningful ones require some interpretation.

Interactions

Most of the interactions in the second study were statistically significant. Since most of the lesser interactions (i.e., signal word x message, icon x signal word) are contained within the larger (icon x color x signal word x warning message) interaction, only this latter interaction was examined.

Overall, regardless of the message or signal word pairing, all icons appearing with a signal word printed in red had higher means than icons with signal words printed in black. This finding is supported in the literature, as color red has been found to communicate the highest levels of hazard, intended carefulness, and attention-getting among colors commonly used in warnings (i.e., red, orange, yellow, green, blue, and black) (Kline et al., 1993; Ryan, 1991).

An interesting interaction was found among icon, message, and signal word for likelihood of avoidance for children participants. At the Crying Baby and Prohibit icons, message 3, the most severe and explicit message, was scored lower than messages 2 and 1, moderately and least severe, respectively. This effect was found for both signal words in the colors red and black. However, message 3 was scored highest paired with the Thumb Down and No Children Under 18 icons, followed by message 2 and message 1. This result indicated that icons as a key component in a warning augment the effect of signal word, color, and message combination. Several explanations may be plausible for this effect. For example, one explanation may be that the Thumb Down and No Children Under 18 icons are concrete in terms of their icon-function relationship, they are simple, and are both fairly familiar symbols (an icon similar to No Children Under 18 is used on my children's toys and products targeted at an older demographic). Another explanation may be that both the Thumb Down and the No Children Under 18 icons are the most explicit on the set of five icons that were tested. That is, the Crying Baby and the Boy icon may be too complex to have the desired effect and the Prohibit icon may be interpreted by minors as "do not enter" more likely than "do not". However, the most plausible explanation may be found in the existing literature of past research on color in

warnings. The Thumb Down and the No Children Under 18 icons are the only two icons in the set of five tested in the second study that include color. The Thumb down icon features a downward pointing thumb surrounded by a green circle background and in the No Children Under 18 icon, the circle with diagonal slash that surround the face and "0-18" is red. Past research has shown that red is usually rated highest in terms of hazard (Braun and Silver, 1995), but the color green is also a hazard connoting color that has been rated by some researchers higher than blue (Bresnahan & Bryk, 1975). Moreover, a well-demonstrated finding regarding color in the warnings literature has been that the use of color makes warnings more noticeable and increases likelihood of compliance (Wogalter et al., 1987; Young & Wogalter, 1990). Since this effect is seen only for the two non- achromatic icons, this may be evidence that icon color also has an effect on the perception of a warning as a whole by augmenting the effects of signal word color and even of the warning message. These results will need to be examined further, with a set of all achromatic icons and a larger sample of minors.

A color x signal word interaction was found for both minor and adult participants. For most variables, no differences were found for the signal word at color (e.g., the word STOP printed in red did not differ from the word STOP printed in black). However, the word STOP (a high hazard word) printed in black was scored lower than the word WARNING (a moderate hazard word) printed in black. This result is supported by previous findings (Braun et al., 1995; Braun and Silver, 1995). Color can augment the perceived hazard of a signal word and the results in the present study demonstrate that color can also affect carefulness and likelihood of avoidance.

General Discussion

The aims of this study were to conduct a preliminary investigation of icons for the purposes of developing a basis for future research of icons for use as part of a warning system to prevent minors from accessing harmful content on the Internet. The second goal of the study was to examine the most effective icons in combination with signal words, signal word color, and warning messages to determine which icons, signal words, and messages are most effective. Overall, the results of the present study are similar to what has been found in past warnings literature. In the first study the highest scored icons were ones that were concrete in terms of their intended function (i.e., the icons closely represented the intended message that they were meant to communicate to the user). The best icons were ones that communicated a message such as "do not" or "no". Although the Crying Baby icon ( ) was selected for use in the second study, it did not turn out to be an effective communicator of risk with the samples that were used here. However, the ratings of this icon indicate that it and icons of this type may be appropriate for use with younger samples, since the pictorial portrays a young child in distress.

Further, the Boy icon ( ), similar in its portrayal of a young child was also one that was scored the highest, indicating that there may be utility in developing a set of icons that portray young children and examining then further with minor samples.

Some of the results that were obtained in the second study were expected and are well-supported by the literature. For example, signal words printed red received higher ratings on all dependent variables than signal words printed in black. This finding has been well documented previously (e.g., Braun et al., 1994). The interaction of color and signal word was somewhat expected, since results have been mixed with regard to the

colors red and black as to their hazard communicating properties (Chapanis, 1994;

Dunlap, Granada, & Kustas, 1986; Leonard, et al., 1986).

Concerning signal words, the signal word STOP was rated higher overall by

participants. However, the color x signal word interaction, where STOP, a high hazard

word, printed in black was scored lower than WARNING, a moderate hazard word

printed in red provides further evidence that color augments not only hazard perception

(Braun et al., 1995), but also such variables as understandability, attention-getting, and

likelihood of avoidance.

The results of the present study provide some guidelines for developing future

warnings aimed at minors. Concerning icons, the best in terms of understandability,

communication of danger, and avoidance are icons that are simple and prohibitive, but

also ones that feature children, since the Boy icon that included a photograph of a child

was scored highest by minors. More signal words need to be tested in order to find ones

most effective for children. However, both STOP and WARNING were effective in this

study, since they did not differ statistically significantly when the control condition was

added to the analyses. Moreover, because an averaging effect has been documented with

regard to color, where a lower lever hazard word such as NOTE paired with a high level

hazard color (e.g., red) may be equivalent in communicating hazard to a high-level

hazard word such as DANGER paired with a lower-level hazard color (e.g., black or

green) (Braun & Silver, 1995). From the results of the present study, red would be a

more effective color for use in warnings, however, more signal word / color combinations

need to be examined with regard to children. Concerning the warning message, there

may be a lesson in the present results that more severe may not always be better with

regard to minors. Since there seems to be a relationship between minors' likelihood of avoidance and severity of warning message with certain icons, messages included on warnings must be sufficiently believable and severe without seeming implausible. For example, the message "This is illegal. Your IP address may be monitored." may simply be more believable than the more sever message that makes the claim that the police may be called. The mention of an IP address is congruent with the activity that the user is engaging in (i.e., using the Internet), whereas calling the police may not seem applicable to the given situation and, therefore loses believability.

Limitations

As with all research efforts, this research project contains several limitations. The most obvious limitation of these studies is the small sample size of the minor participants, which in turn limited the statistical power of the analyses. Because it was not originally planned to include the minors as a part of the sample for this project, plans were not made for collecting data from children and the samples used in these two studies were those of convenience. With a larger sample of minor participants, the results of the present studies can be confirmed or examined further.

Another limitation of the present studies were the dependent variable measurement scales. Although it is the accepted practice in the area of warnings research to measure a dependent variable with single-question measurement, a better way to measure some of the dependent variables may have been with a measurement scale consisting of a few items. This would allow for a more reliable variable measurement, ensure that participants better understand what is being measured, and provide more detailed results.

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Due to the time constraints and the nature of this project, a limited number of variables was examined in the second study. For example, for the signal word variable only STOP and WARNING, a high and moderate hazard words, respectively, were included. This study would have benefitted from the inclusion of a low hazard word, such as NOTE or IMPORTANT. Additionally, a limited number of colors were used in the second study. The colors green and blue have shown a low perception of hazard (Braun et al., 1995) and inclusion of those colors may have provided a more discernible interaction and main effects.

Future Research

In many ways, minors do not differ from adults in their perception of warnings components. For example, signal words and signal word color are rated approximately the same by both age groups. Icons most effective in warnings, those that are concrete and have a close icon-function association are needed for the warning to be salient and effective for both minors and adults. However, there are several key ways in which minors differ from adults and future research needs to concentrate on those components. Adolescents possess a unique perception of risk. As demonstrated in the developmental research literature, adolescents believe themselves to be immune to some of the dangers of life (Elkind, 1967). This knowledge about adolescent development must be incorporated into future research on warnings constructed specifically for adolescents (12 – 17-yearolds).

Another avenue of exploration is research with different age groups. Five-year-olds who know how to use the Internet, but rely on images more than written content to navigate the web are vastly different developmentally from thirteen-year-olds

developmentally, cognitively, emotionally, and with regard to Internet behaviors. In this sense, one size may not fit all in terms of warnings developed for minors. This means that different images and colors need to be tested with various age groups.

Hunn and Dingus (1992) reviewed warnings literature and discovered that most warnings receive about 50% compliance, a much lower rate than specified by ANSI (85%) and ISO (67%) recommended standards. The authors proposed that to increase warning compliance the *interactivity* of warnings must be considered. The authors defined interactivity as the interaction between the user of the product and the warning label. They pointed out that increased interaction should lead to an increased amount of attention being paid to the warning. This way of thinking may be applied to warnings designed for the Internet. The interactivity variable with regard to minors must be examined and any effects incorporated into the design of warnings targeted at minors.

The expectation of risk from Internet content needs to be examined. DeJoy (1997) points out that the importance of prior expectations when viewing warnings is important for two reasons. First, warning effectiveness increases with increased expectation of hazardous consequences. If the expectation of hazard is high, the likelihood of compliance with a warning is also high. Second, familiarity decreases warning effectiveness (LaRue & Cohen, 1987; Wogalter, et al., 1991). That is, in a familiar situation, individuals may pay less attention and heed to warnings than in a novel situation or a new environment. This coupled with the developmentally situational feelings of invincibility that teens and children experience, makes for a unique situation. Further, children and adolescents are on familiar ground on the Internet and their lack of expectation of negative consequences in a familiar environment exacerbates the potential

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of negative consequence. Additionally, this creates the possibility that traditional warnings may not be effective.   It is not clear whether warnings need to be more severe for salience to be made more effective or familiar and easily understandable. These factors need to be examined in future research. Another factor, perhaps one of the most important in terms of warning effectiveness is that of behavioral compliance. Although comprehensibility of warning messages may increase with severity, the compliance with the warning may not be affected. Factors that lead to both comprehensibility and compliance need to be examined and established with children participants.

Finally, the dilemma of minors' access to adult content on the Internet still remains. Seemingly, the results of this research project indicate that minors are likely to avoid content provided that they see warnings with comprehensible icons and sever warning messages. However, these warnings have not been tested in the context of Internet browsing and it is not clear whether when applied to a real-life situation, they will be as effective.

It must also be mentioned here, that the current project, although comprehensive it its entirety is a work in progress and is an initial step towards a larger, more in-depth examination of warnings targeted at minors on the Internet.

APPENDIX A

IMAGES USED IN STUDY 1

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
1		Free font website: www.dafont.com	**Sad**	Abstract (>10)	No	No
2		Free font website: www.dafont.com	**Stop**	Abstract (>10)	No	Yes
3		Free font website: www.dafont.com	**Stop/Do not enter**	Concrete (3)	No	No
4		Free font website: www.dafont.com	**Sad computer**	Abstract (>10)	No	No
5		Free font website: www.dafont.com	**Upset parent (Dad)**	Abstract (>10)	No	No

Note. Meanings in bold were proposed by the researcher. No prior meaning for this icon exists.

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
6		Free font website: www.dafont.com	Attention	Concrete (3)	Yes	No
7		Free font website: www.dafont.com	**Danger**	Abstract (>10)	No	No
8		Free font website: www.dafont.com	**Exit**	Abstract (>10)	No	No
9		Free font website: www.dafont.com	Do Not or No	Concrete (2)	Yes	Yes
10		Free font website: www.dafont.com	**Upset parent (Mom)**	Abstract (>10)	No	No

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
11		Original design by Mac McRae http://macmcrae.com Used with artist's permission.	**Danger**	Abstract (>10)	No	No
12		Free font website: www.dafont.com	**Danger**	Abstract (<10)	No	No
13		Free font website: www.dafont.com	**Danger**	Abstract (>10)	Yes	No
14		Free clip art website: free-clipart.net	Attention	Concrete (2)	Yes	Yes
15		Free font website: www.dafont.com	Do Not Enter	Concrete (3)	Yes	Yes
16		Free font website: www.dafont.com	**Danger**	Abstract (>10)	No	No
17			**Stranger Danger or Danger on the Computer**	Abstract (>10)	No	No

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
18		Getty Images www.gettyimages.com	**Stop**	Abstract (>10)	No	Yes
19		Free clip art website: free-clipart.net	**Stranger Danger**	Abstract (>10)	No	No
20		Free font website: www.dafont.com	**Computer Caution**	Abstract (>10)	No	No
21		Microsoft Word 2007 clip art image	No/Reject	Abstract (>10)	Yes	Yes
22		Free font website: www.dafont.com	**Upset parents**	Abstract (>10)	No	No
23		Free clip art website: free-clipart.net	**Caution/ Danger**	Abstract (>10)	Yes	Yes

mage No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
24		Free clip art website: free-clipart.net	**Caution/ Danger**	Abstract (>10)	Yes	Yes
25		Free clip art website: free-clipart.net	**Caution/ Danger**	Abstract (>10)	Yes	Yes
26		Free clip art website: free-clipart.net	**Caution/ Stop**	Abstract (>10)	Yes	Yes
27		Free clip art website: free-clipart.net	**Caution/ Danger**	Abstract (>10)	Yes	Yes
28		Free clip art website: free-clipart.net	**Caution/ Stop**	Abstract (>10)	Yes	Yes
29		Free clip art website: free-clipart.net	**Hurt Child/ Danger**	Abstract (>10)	No	No

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
30		Created with Adobe Photoshop	**No/Do Not Use Computer**	Abstract (>10)	No	Yes
31		Created with Adobe Photoshop	**No/Do Not Use Computer**	Abstract (>10)	No	Yes
32		Created with Adobe Photoshop	**Danger from Computer or Caution of Computer**	Abstract (>10)	No	No
33		Created with Adobe Photoshop	**No/Do Not Use Computer**	Abstract (>10)	No	Yes
34		Created with Adobe Photoshop	No Children age 0 - 18 years	Concrete (4)	Yes	Yes

Image No.	Image	Where obtained	Meaning	Concrete vs. Abstract (score)	Familiar	Prohibitive
35		Created with Adobe Photoshop	**Caution of Computer**	Abstract (>10)	No	No
36		Created with Adobe Photoshop	No children	Abstract (>10)	No	Yes
37		Created with Adobe Photoshop	**No children on computer**	Abstract (>10)	No	Yes
38		Created with Adobe Photoshop	**Do not use computer**	Abstract (>10)	No	Yes

APPENDIX B

DEMOGRAPHIC QUESTIONNAIRE

1. Age _____

2. Gender (please select one)

   □ Male

   □ Female

3. Please indicate your race / ethnicity (please choose one from the list below)

   □ African American

   □ Asian/Pacific Islander

   □ Caucasian

   □ Hispanic/Latino(a)

   □ Other _____ (please indicate In the space provided)

4. What language(s) was predominantly spoken by your family? (please choose one)

   □ English

   □ Other than English

   □ Both English and another language

5. What is your marital status?

   □ Married

   □ Partnered (in a committed relationship)

   □ Single

   □ Separated

   □ Divorced

   □ Widowed

□ Decline to answer

6. Do you have children?

□ Yes □ No □ Decline to answer

7. If you have children, what are their ages? (please choose all that apply)

□ 0-2 years

□ 3-5 years

□ 5-9 years

□ 10-14 years

□ 15-18 years

□ Decline to answer

8. Do you have any siblings?   □ Yes   □ No   □ Decline to answer

9. If you have siblings, please indicate their relationship and number of siblings:

□ Sister(s) _____

□ Brother(s) _____

□ Step-sister(s) _____

□ Step-brother(s) ____

□ Decline to answer

10. How often do you use the Internet?

□ Never

□ Once or twice a month

□ Once or twice a week

□ Once or twice a day

□ Multiple times per day (more than twice)

11. In a typical week, approximately how many hours per day do you spend using the

Internet? _____

APPENDIX C

IRB APPROVAL FORMS

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

Department of Psychology
4505 Maryland Parkway
Mail Stop 405030
Las Vegas, NV 89154

INFORMED CONSENT FORM

Title of Study: Internet Safety Warnings Study

Protocol #:

Investigator(s): Dr. N.C. Silver and Helen Zaikina-Montgomery

Contact: 702-373-0260 or zaikinah@unlv.nevada.edu (Helen Zaikina-Montgomery)

    702-895-0191 or dnsilvr@unlv.nevada.edu (Dr. N.C. Silver)

Purpose of the Study: The purpose of this study is to examine the effectiveness of images to be used in warnings and warnings themselves, which would potentially prevent minors from accessing undesirable content on the Internet.

Study Duration: This study should take about an hour to complete.

Cost/Credit: There is NO COST to you to participate in this study. If you are participating in this study for a course research credit requirement, you will be assigned ONE participation credit. You will NOT be penalized for stopping participation. You may stop participation in the study at any time. Your participation is strictly VOLUNTARY.

Participants: You are being asked to participate in this study because you are at least 18 years old. We believe that your participation will help us better measure the understandability and appropriateness of warning images.

Procedures: If you agree to participate in this study you will be asked to report general demographic information about yourself and to complete several questionnaires pertaining to warning images and warnings. Your opinions are very important to us and we ask that you answer all questions as openly and honestly as you can.

Benefits of Participation: By participating in this study you are helping to add to the body of knowledge on the subject of warnings as well as providing valuable feedback about warnings that may have a practical application.

Risks of Participation: Minimal risks are associated with the participation in this study that do not differ significantly with those encountered in daily life. If for any reason discomfort as a result of

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completing the questions is prolonged, you will be emailed with a list of referrals to seek appropriate services at your request.

Confidentiality: All information gathered from you during this study will be kept confidential. Your names will be used to assign credits ONLY and **will not** be associated with your responses. No identifying information from the computer or Internet connection that you are using will be requested or recorded. All data from all participants will be analyzed at once with no identifying information included in the analysis process.

Study Results: If you are interested in the results of the study or would like to receive any additional information about this research project, please contact Helen Zaikina-Montgomery or Dr. N.C. Silver at the telephone numbers or email addresses provided above.

<div align="center">

PARTICIPANT CONSENT:

</div>

By choosing "Accept and Proceed to Survey" below I am stating that I am 18 years of age or older and that I have read the above information and that I agree to participate in this study. I understand that my participation is VOLUNTARY and I may discontinue participating at any time with no penalty. Selecting this option will serve as my electronic signature to signify that I have read and understand this informed consent statement.

To print this page, please lick the "Print" button on your Internet browser.

O Accept and Proceed to Survey

O Do not accept and exit the study

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

PARENT PERMISSION FORM

Department of Psychology

TITLE OF STUDY: Internet Warnings Study with School Aged Children

INVESTIGATOR(S): Clayton N. Silver, Ph.D & Helen Zaikina-Montgomery, M.A.

CONTACT PHONE NUMBER: 702-895-0107 or 702-373-0260

Purpose of the Study
Your child is invited to participate in a research study. The purpose of this study is to conduct an investigation of icons and warnings that can be used on the Internet to prevent children from accessing undesirable content online.

Participants
Your child is being asked to participate in the study because their opinions about the images that will be presented in this study is very important to this research project as well as to the general body of knowledge on this subject.

Procedures
If you allow your child to volunteer to participate in this study, your child will be asked to do the following:

Look at pictures (icons) and rate them for how understandable they are and how likely they would be to avoid websites where they would see the image. Your child may also be asked to review warnings and rate them for how understandable they are as well as how likely they would be to avoid websites where they would see the warning. Your child WILL NOT see any actual websites. The images that will be shown to your child are not significantly different from images that they would see on warnings in daily life.

Benefits of Participation
There *may not* be direct benefits to your child as a participant in this study. However, we hope to learn more about the icons and / or warnings that will be presented in this study and how well children understand them as well as how likely they are to influence whether children may avoid websites on which they saw the warnings.

Risks of Participation
There are risks involved in all research studies. This study may include only minimal risks. *Your child may get bored as the study goes on or slightly fatigued as they view all of the images.*

Cost /Compensation
There *will not* be financial cost to you to participate in this study. The study will take approximately one (1) hour of your child's time. Your child *will not* be compensated for their time.

Participant Initials_____

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TITLE OF STUDY: Internet Warnings Study with School Aged Children

INVESTIGATOR(S): Clayton N. Silver, Ph.D & Helen Zaikina-Montgomery, M.A.

CONTACT PHONE NUMBER: 702-895-0107 or 702-373-0260

Contact Information

If you or your child has any questions or concerns about the study, you may contact Helen Zaikina-Montgomery at **702-373-0260** or via email at zaikinah@unlv.nevada.edu or Dr. N.C. Silver at **702-895-0191** or via email at fdnsilvr@unlv.nevada.edu. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office for the Protection of Research Subjects at 702-895-2794.**

Voluntary Participation

Your child's participation in this study is strictly voluntary. Your child may refuse to participate in this study or in any part of this study. Your child may withdraw at any time without prejudice to your relations with the university. You and your child are encouraged to ask questions about this study at the beginning or any time during the research study. If at any time you personally feel that you would like your child to discontinue participation in the study, you may do so with no consequences or prejudice to you, your child, or your relations with the university.

Confidentiality

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link your child to this study. All records will be stored in a locked facility at UNLV for 7 years after completion of the study. After the storage time the information gathered will be destroyed. All data gathered in this study will not contain any identifiable information about your child.

Participant Consent:

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

_____   _____
Signature of Parent   Child's Name (Please print)

_____   _____
Parent Name (Please Print)   Date

Participant Note: Please do not sign this document if the Approval Stamp is missing or is expired.

Participant Initials _____

2 of 2

Table 3

Inter-rarer reliabilities for the question "In your opinion, what does this icon mean?"
and percentages of correct identification of icon meaning

Icon	*r*	%	95% CI	Icon	*r*	%	95% CI
1	**.896**	**82.5**	**≤ 77 μ ≤ 87**	**21**	**.949**	**88.6**	**≤ 85 μ ≤ 93**
2	.876	49.0	≤ 42 μ ≤ 56	22	1.00	34.9	≤ 28 μ ≤ 42
3	.917	51.0	≤ 44 μ ≤ 58	23	1.00	2.6	≤ 1 μ ≤ 5
4	.819	6.7	≤ 3 μ ≤ 11	24	1.00	2.6	≤ 1 μ ≤ 5
5	.937	13.9	≤ 9 μ ≤ 19	25	.940	4.1	≤ 1 μ ≤ 7
6	.999	33.2	≤ 26 μ ≤ 40	26	.985	77.7	≤ 72 μ ≤ 84
7	.940	5.2	≤ 2 μ ≤ 8	27	.877	4.7	≤ 2 μ ≤ 8
8	1.00	1.0	≤ 0 μ ≤ 2	28	.989	42.0	≤ 35 μ ≤ 49
9	**.872**	**88.1**	**≤ 84 μ ≤ 92**	29	.977	34.4	≤ 27 μ ≤ 41
10	1.00	15.5	≤ 8 μ ≤ 16	30	.986	74.6	≤ 69 μ ≤ 81
11	1.00	0.0	--	31	.963	16.1	≤ 11 μ ≤ 21
12	1.00	9.3	≤ 5 μ ≤ 13	32	.972	9.9	≤ 6 μ ≤ 14
13	.932	11.9	≤ 7 μ ≤ 15	33	1.00	77.5	≤ 71 μ ≤ 83
14	.929	75.8	≤ 70 μ ≤ 80	**34**	**.983**	**81.3**	**≤ 75 μ ≤ 87**
15	.999	42.0	≤ 35 μ ≤ 49	35	.808	6.3	≤ 3 μ ≤ 9
16	1.00	1.0	≤ 0 μ ≤ 2	36	.968	19.2	≤ 13 μ ≤ 25
17	.956	38.5	≤ 32 μ ≤ 46	37	.972	25.1	≤ 13 μ ≤ 31
18	**.915**	**87.6**	**≤ 83 μ ≤ 93**	38	1.00	44.6	≤ 38 μ ≤ 52
19	.967	37.8	≤ 31 μ ≤ 45	Overall	.979		
20	1.00	1.0	≤ 0 μ ≤ 2				

Note. All correlations are statistically significant at .05 level. Icons in bold were selected for inclusion in Study 2.

Table 4

Means and standard deviations for understandability questions (items 2, 3, and 4)

	Question 2		Question 3		Question 3		Understandability Composite
Icon	*M (SD)*	*N*	*M (SD)*	*N*	*M (SD)*	*N*	*M (SD)*
1	**6.16 (2.57)**	**194**	**6.29 (2.46)**	**193**	**6.63 (2.28)**	**189**	**6.37 (2.11)**
2	4.35 (2.32)	194	3.91 (2.47)	192	5.29 (2.29)	190	4.53 (2.03)
3	4.45 (2.41)	192	3.23 (2.27)	192	5.46 (2.20)	190	4.38 (1.96)
4	3.67 (2.16)	193	3.39 (2.21)	192	5.17 (2.24)	190	4.06 (1.80)
5	3.35 (2.33)	193	3.07 (2.24)	192	4.25 (2.30)	191	3.53(1.90)
6	5.99 (2.54)	193	4.41 (2.56)	192	6.36 (2.28)	190	5.59 (2.08)
7	3.86 (2.60)	192	3.56 (2.40)	192	4.42 (2.38)	191	3.95 (2.07)
8	7.58 (1.73)	193	6.11 (2.13)	192	7.72 (1.79)	190	7.13 (1.55)
9	**7.98 (1.77)**	**193**	**5.39 (2.44)**	**190**	**7.69 (1.73)**	**190**	**7.01 (1.61)**
10	2.97 (2.17)	193	2.74 (2.08)	192	4.00 (2.45)	190	3.21 (1.85)
11	2.99 (2.33)	192	4.34 (2.66)	192	4.11 (2.43)	190	3.82 (2.06)
12	3.00 (2.09)	191	4.12 (2.45)	192	4.33 (2.22)	191	3.79 (1.89)
13	5.26 (2.78)	194	4.84 (2.55)	192	6.21 (2.34)	187	5.43 (2.17)
14	7.24 (2.18)	192	4.39 (2.48)	192	7.11 (1.99)	191	6.23 (1.80)
15	5.38 (2.62)	193	2.72 (2.11)	192	5.61 (2.33)	188	4.56 (1.96)
16	4.76 (2.68)	193	5.08 (2.64)	193	5.84 (2.52)	191	5.20 (2.33)
17	4.28 (2.28)	193	2.68 (1.86)	193	5.37 (2.30)	190	4.11 (1.75)
18	**6.34 (2.06)**	**194**	**5.96 (2.24)**	**193**	**6.29 (1.88)**	**191**	**6.40 (1.73)**
19	4.30 (2.22)	194	3.30 (2.04)	193	5.47 (2.06)	191	4.35 (1.75)

20	4.63 (2.12)	194	2.92 (1.71)	193	5.65 (2.05)	190	4.39 (1.55)
21	**7.15 (2.10)**	**193**	**6.32 (2.36)**	**193**	**7.71 (1.83)**	**191**	**7.03 (1.83)**
22	4.39 (2.44)	194	2.79 (1.92)	193	5.82 (2.37)	191	4.33 (1.82)
23	6.25 (2.18)	194	4.18 (2.23)	192	6.99 (1.77)	189	5.79 (1.60)
24	5.41 (2.44)	194	4.57 (2.26)	193	6.64 (1.97)	190	5.54 (1.75)
25	5.42 (2.42)	193	5.55 (2.46)	192	6.77 (2.02)	191	5.91 (1.85)
26	6.40 (2.08)	194	5.84 (2.28)	192	7.15 (1.87)	189	6.46 (1.64)
27	5.15 (2.33)	194	4.15 (2.14)	191	6.30 (2.11)	190	5.20 (1.81)
28	4.86 (2.18)	194	4.85 (2.36)	192	6.11 (2.15)	191	5.27 (1.84)
29	4.37 (2.28)	194	3.86 (2.15)	192	5.38 (2.00)	189	4.54 (1.79)
30	7.38 (1.76)	193	5.65 (2.23)	192	7.71 (1.62)	191	6.90 (1.53)
31	6.05 (2.03)	194	3.37 (1.93)	190	6.50 (1.84)	189	5.32 (1.54)
32	4.07 (2.18)	193	2.47 (1.89)	192	5.05 (2.11)	191	3.95 (1.70)
33	7.02 (2.01)	193	5.76 (2.37)	191	7.54 (1.68)	191	6.83 (1.63)
34	**6.46 (2.57)**	**194**	**3.15 (2.10)**	**194**	**6.63 (2.27)**	**191**	**5.41 (1.93)**
35	3.39 (1.95)	194	3.77 (2.09)	191	4.47 (1.89)	191	3.84 (1.57)
36	5.11 (2.38)	193	3.99 (2.18)	192	6.17 (2.06)	190	5.06 (1.77)
37	4.54 (2.49)	194	3.04 (1.87)	191	5.61 (2.20)	190	4.40 (1.78)
38	5.00 (2.45)	192	4.01 (2.35)	191	6.09 (2.06)	190	5.02 (1.91)

Note. Icons in bold were selected for inclusion in Study 2.

Table 5

Means and standard deviations of the danger composite score

Icon	*M*	*SD*	*N*	Icon	*M*	*SD*	*N*
1	**2.86**	**1.80**	**188**	20	2.59	1.75	187
2	3.24	2.01	188	**21**	**4.56**	**2.13**	**187**
3	4.75	1.94	187	22	3.29	1.98	188
4	1.86	1.16	187	23	5.29	2.20	187
5	2.09	1.49	188	24	5.08	2.25	187
6	6.00	2.33	187	25	4.68	2.34	187
7	4.39	2.49	187	26	5.18	2.17	188
8	3.08	2.07	187	27	4.70	2.29	187
9	**5.65**	**2.09**	**187**	28	4.52	2.24	187
10	2.16	1.59	187	29	3.34	1.88	187
11	2.32	1.82	187	30	4.36	2.41	188
12	3.87	2.26	187	31	3.94	2.27	188
13	4.69	1.76	186	32	4.34	2.21	187
14	7.05	1.86	187	33	4.40	2.49	187
15	3.71	1.52	188	**34**	**4.54**	**2.28**	**187**
16	3.80	2.03	187	35	2.55	1.56	188
17	4.97	2.75	187	36	3.38	1.95	187
18	**4.49**	**2.05**	**187**	37	3.63	2.10	187
19	5.69	2.24	187	38	4.51	2.29	187

Note. Icons in bold were selected for inclusion in Study 2.

Table 6

Means and standard deviations for question 5, "How careful would you be after seeing this icon?"

Icon	M (SD)	N	Icon	M (SD)	N
1	**4.54 (2.26)**	**187**	20	3.10 (1.95)	188
2	3.53 (2.23)	188	**21**	**4.79 (2.41)**	**188**
3	5.59 (2.15)	187	22	3.24 (2.21)	187
4	1.93 (1.31)	188	23	6.83 (2.19)	188
5	2.45 (1.81)	187	24	6.66 (2.21)	187
6	6.39 (2.42)	187	25	6.28 (2.36)	186
7	4.21 (2.77)	187	26	6.68 (2.19)	188
8	4.10 (2.47)	188	27	6.43 (2.35)	187
9	**6.65 (2.03)**	**188**	28	5.59 (2.42)	187
10	2.45 (1.81)	188	29	3.75 (2.19)	187
11	2.27 (1.98)	188	30	5.38 (2.40)	188
12	3.87 (2.51)	188	31	5.11 (2.39)	188
13	4.85 (2.61)	187	32	4.96 (2.34)	188
14	7.52 (1.74)	186	33	5.68 (2.43)	187
15	5.60 (2.24)	187	**34**	**4.602.61**	**188**
16	4.29 (2.51)	187	35	2.98 (2.04)	187
17	5.16 (2.89)	187	36	3.86 (2.36)	188
18	**5.06 (2.20)**	**187**	37	4.04 (2.47)	187
19	5.95 (2.45)	186	38	5.26 (2.42)	187

Note. Icons in bold were selected for inclusion in Study 2.

Table 7

Means and standard deviations for question 6, "What is the likelihood of encountering danger implied by this icon?"

Icon	M (SD)	N	Icon	M (SD)	N
1	**2.85 (2.01)**	**188**	20	2.67 (1.90)	186
2	3.37 (2.23)	188	**21**	**4.31 (2.38)**	**187**
3	5.01(2.08)	187	22	3.30 (2.21)	187
4	1.87 (1.31)	187	23	5.56 (2.44)	187
5	2.18 (1.58)	187	24	5.38 (2.46)	187
6	6.24 (2.40)	187	25	4.95 (2.59)	185
7	4.51 (2.69)	187	26	5.43 (2.30)	187
8	3.31 (2.38)	186	27	4.93 (2.55)	186
9	**6.04 (2.26)**	**187**	28	4.62 (2.50)	187
10	2.20 (1.73)	187	29	3.33 (2.21)	187
11	2.36 (2.03)	187	30	4.55 (2.57)	186
12	4.02 (2.58)	187	31	4.07 (2.53)	185
13	4.95 (2.60)	186	32	4.39 (2.42)	185
14	7.28 (1.93)	186	33	4.45 (2.61)	187
15	5.40(2.33)	184	**34**	**4.05 (2.45)**	**185**
16	4.05 (2.24)	186	35	2.55 (1.67)	186
17	5.09 (2.96)	187	36	3.39 (2.16)	187
18	**4.45 (2.23)**	**186**	37	3.63 (2.28)	186
19	5.82 (2.36)	187	38	4.60 (2.61)	187

Note. Icons in bold were selected for inclusion in Study 2.

Table 8

Means and standard deviations for question 7, "What is the severity of danger implied by this icon?"

Icon	M	SD	N	Icon	M	SD	N
1	**2.88**	**2.07**	**184**	20	2.49	1.96	184
2	3.13	2.11	184	**21**	**3.78**	**2.33**	**181**
3	4.45	2.20	184	22	3.32	2.16	185
4	1.85	1.32	184	23	5.03	2.42	183
5	1.97	1.65	185	24	4.82	2.40	185
6	5.77	2.52	185	25	4.47	2.49	185
7	4.27	2.57	184	26	4.92	2.38	185
8	2.85	2.16	185	27	4.49	2.39	185
9	**5.24**	**2.25**	**183**	28	4.46	2.43	184
10	2.15	1.79	186	29	3.39	2.13	184
11	2.30	1.93	185	30	4.15	2.52	183
12	3.76	2.28	185	31	3.83	2.36	185
13	4.73	2.50	184	32	4.30	2.36	185
14	6.83	2.06	183	33	4.34	2.67	185
15	5.02	2.38	185	**34**	**4.26**	**2.46**	**185**
16	3.57	2.19	185	35	2.58	1.77	184
17	4.90	2.81	185	36	3.40	2.09	184
18	**4.12**	**2.21**	**185**	37	3.62	2.28	183
19	5.57	2.51	184	38	4.38	2.32	184

Note. Icons in bold were selected for inclusion in Study 2.

Table 9

Means and standard deviations for question 8, "How attention-getting is this icon?"

Icon	*M*	*SD*	*N*	Icon	*M*	*SD*	*N*
1	**5.17**	**2.32**	**185**	20	3.51	1.90	184
2	3.95	2.11	184	**21**	**4.99**	**2.08**	**184**
3	4.64	2.39	185	22	3.63	2.10	183
4	2.18	1.50	185	23	5.47	2.12	184
5	1.87	1.52	182	24	4.77	2.21	184
6	7.06	2.25	185	25	5.44	2.16	184
7	5.13	2.39	185	26	6.32	2.13	183
8	4.54	2.11	183	27	5.25	2.21	183
9	**5.38**	**2.16**	**185**	28	5.29	1.99	184
10	2.04	1.67	185	29	4.15	1.86	185
11	5.50	2.54	183	30	6.34	2.14	184
12	4.59	2.22	184	31	5.29	2.05	184
13	5.16	2.18	185	32	5.24	2.20	185
14	7.36	1.87	185	33	6.17	2.17	185
15	4.88	2.09	185	**34**	**5.91**	**2.23**	**185**
16	3.86	2.13	184	35	3.50	2.04	185
17	5.84	2.70	184	36	5.38	2.10	184
18	**5.22**	**2.01**	**184**	37	5.05	2.11	184
19	6.03	2.20	185	38	5.41	2.29	185

Note. Icons in bold were selected for inclusion in Study 2.

Table 10

Means and standard deviations for question 9, "If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?"

Icon	*M*	*SD*	*N*	Icon	*M*	*SD*	*N*
1	**5.51**	**2.598**	**185**	20	3.23	2.299	185
2	3.29	2.500	185	**21**	**5.11**	**2.461**	**185**
3	5.14	2.298	185	22	2.84	2.055	183
4	2.49	2.080	185	23	4.92	2.605	185
5	2.59	2.231	184	24	4.38	2.591	185
6	6.17	2.661	183	25	4.22	2.633	185
7	4.07	2.643	183	26	5.74	2.525	184
8	3.38	2.532	184	27	4.21	2.625	185
9	**5.96**	**2.343**	**182**	28	4.71	2.535	185
10	2.42	2.198	185	29	3.65	2.437	186
11	3.30	2.580	185	30	6.58	2.527	184
12	3.66	2.500	184	31	5.88	2.602	185
13	4.61	2.795	184	32	5.69	2.722	185
14	7.30	2.099	185	33	6.64	2.368	183
15	5.46	2.567	184	**34**	**4.68**	**2.683**	**184**
16	3.45	2.474	186	35	3.26	2.299	178
17	5.82	2.847	184	36	4.31	2.434	185
18	**4.90**	**2.321**	**184**	37	4.63	2.693	182
19	5.75	2.598	183	38	5.90	2.595	184

Note. Icons in bold were selected for inclusion in Study 2.

Table 11

Means and standard deviations for question 10 "How familiar are you with this icon?"

Icon	*M*	*SD*	*N*	Icon	*M*	*SD*	*N*
1	4.48	2.876	183	20	4.09	2.499	182
2	3.22	2.542	180	21	6.52	2.524	182
3	4.86	2.557	180	22	3.12	2.341	183
4	3.02	2.291	183	23	6.19	2.468	183
5	2.36	2.209	183	24	6.44	2.371	183
6	6.32	2.505	182	25	6.48	2.394	182
7	3.59	2.852	183	26	6.46	2.167	180
8	7.10	2.172	183	27	6.04	2.546	181
9	7.85	1.846	181	28	5.33	2.490	183
10	2.42	2.320	182	29	3.34	2.320	183
11	3.01	2.513	183	30	6.80	2.290	182
12	3.21	2.475	182	31	4.97	2.541	181
13	5.97	2.528	182	32	4.21	2.439	182
14	7.75	1.760	181	33	6.68	2.297	183
15	6.20	2.508	182	34	4.89	2.720	181
16	4.84	2.741	181	35	2.71	2.091	182
17	3.98	2.601	181	36	4.05	2.588	183
18	5.01	2.474	180	37	3.92	2.683	183
19	3.71	2.604	182	38	4.59	2.707	182

Table 12

Correlations among questions 2 through 10 from Study 1 for adult participants

Item	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Q2	--	.656*	.960*	.051	-.017	-.056	.040	.031	.159
Q3		--	.679*	-.286	-.278	-.288	-.172	-.134	-.202
Q4			--	.014	-.036	-.072	.007	-.010	.123
Q5				--	.942*	.921*	.765*	.800*	.816*
Q6					--	.988*	.771*	.818*	.731*
Q7						--	.804*	.830*	.676*
Q8							--	.830*	.646*
Q9								--	.666*
Q10									--

Note. N = 38 for each correlation, because correlations were computed for each icon, using the mean rating for each question. Q2 = "How understandable is this icon to you?", Q3 = "How understandable do you think this icon is to young children (ages 3 to 11 years old)?", Q4 = "How understandable do you think this icon is to adolescents (ages 12 to 17 years old)?", Q5 = "How careful would you be after seeing this icon?", Q6 =" What is the likelihood of encountering danger implied by this icon?", Q7 = "What is the severity of danger implied by this icon?", Q8 = "How attention-getting is this icon?", Q9 = "If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?", Q10 = "How familiar are you with this icon?". Correlations marked with an asterisk are statistically significant at the .01 level using the Benjamini –Hochberg correction.

Table 13

Means and standard deviations for the understandability and likelihood of avoidance questions for minor participants

Understandability	M	SD	N	Avoidance	M	SD	N
I1	**7.18**	**2.31**	**11**	**I1**	**3.64**	**2.97**	**11**
I2	5.45	2.33	11	I2	3.09	2.42	11
I3	5.73	3.06	11	I3	5.45	3.11	11
I4	5.73	2.86	11	I4	2.00	2.49	11
I5	4.73	2.24	11	I5	2.82	3.12	11
I6	6.64	2.42	11	I6	4.82	2.60	11
I7	4.45	2.50	11	I7	3.36	3.10	11
I8	8.00	1.89	11	I8	2.09	1.37	11
I9	**8.36**	**1.28**	**11**	**I9**	**6.91**	**2.42**	**11**
I10	3.36	1.74	11	I10	2.73	3.16	11
I11	3.09	1.97	11	I11	2.82	2.60	11
I12	3.27	2.24	11	I12	3.82	2.78	11
I13	6.18	2.52	11	I13	3.64	2.94	11
I14	8.27	1.42	11	I14	6.91	3.11	11
I15	5.64	3.04	11	I15	7.10	2.84	10
I16	6.00	2.89	11	I16	3.09	3.17	11
I17	5.27	2.97	11	I17	5.09	3.41	11
I18	**8.09**	**1.57**	**11**	**I18**	**5.36**	**2.06**	**11**
I19	5.55	2.84	11	I19	5.36	3.85	11
I20	5.45	3.23	11	I20	2.55	1.50	11
I21	**7.45**	**1.96**	**11**	**I21or**	**4.36**	**2.24**	**11**
I22	4.64	3.26	11	I22	3.45	2.91	11
I23	7.36	2.46	11	I23	6.00	2.44	11
I24	6.82	2.60	11	I24	4.45	2.94	11
I25	6.82	2.60	11	I25	4.36	3.13	11
I26	8.45	1.03	11	I26	6.55	2.29	11
I27	6.45	2.50	11	I27	4.45	3.23	11
I28	6.91	2.25	11	I28	5.60	2.91	10
I29	4.27	3.06	11	I29	3.50	2.71	10

I30	8.64	.674	11	I30	5.82	2.82	11
I31	7.91	1.13	11	I31	5.45	2.46	11
I32	5.27	2.37	11	I32	4.91	2.34	11
I33	8.36	.924	11	I33	5.91	2.98	11
I34	**6.00**	**3.57**	**11**	**I34**	**5.70**	**3.05**	**10**
I35	4.82	2.96	11	I35	3.27	2.37	11
I36	7.45	2.46	11	I36	5.40	2.83	10
I37	6.55	2.69	11	I37	5.10	3.14	10
I38	7.00	3.06	11	I38	6.73	1.90	11

Note. 'I' followed by the number indicates the icon's number in Appendix A.

Table 14

Means and standard deviations for understandability composite score, carefulness, likelihood of danger, severity of danger, attention-getting, likelihood of avoidance, and familiarity in Study I

		Meaning		Familiarity		Abstractness		Prohibitiveness	
		K	NK	F	NF	A	C	P	NP
Understand. Composite	M	4.96	5.52	5.80	4.74	5.03	5.53	5.72	4.59
	SD	1.09	1.07	.718	1.10	1.13	.996	.891	1.01
Carefulness	M	4.65	5.21	6.06	4.17	4.61	6.06	5.48	4.13
	SD	1.39	1.58	.901	1.13	1.36	1.02	1.09	1.40
Likelihood of danger	M	4.09	4.85	5.31	3.77	4.03	5.67	4.72	3.81
	SD	1.01	1.53	.858	1.02	1.07	1.11	.964	1.34
Severity of Danger	M	3.84	4.55	4.91	3.58	3.79	5.26	4.40	3.60
	SD	.993	1.34	.746	.955	.961	.942	.824	1.21
Attention-getting	M	4.66	5.76	5.63	4.50	4.71	5.87	5.47	4.45
	SD	1.22	.874	.811	1.28	1.22	1.13	.747	1.37
Likelihood of avoidance	M	4.37	5.29	5.14	4.33	4.40	5.69	5.18	3.99
	SD	1.23	1.22	.948	1.36	1.24	1.08	1.06	1.20
Familiarity	M	4.65	5.66	6.34	4.16	4.63	6.31	5.73	4.12
	SD	1.49	1.66	.802	1.32	1.48	1.31	1.30	1.37

Note. K = meaning known, NK = meaning not known, F = familiar, NF – not familiar, A = abstract, C = concrete, *p* = prohibitive, NP = not prohibitive

Table 15

Correlations among questions 1 through 5 for adults in Study 2

	Q1	Q2	Q3	Q4	Q5
Q1	--	.527	.503	.462	.326
Q2		--	.866	.692	.683
Q3			--	.800	.719
Q4				--	.731
Q5					--

Note. All correlations were statistically significant at the 0.01 level (2-tailed). Q1: "How understandable is this icon to you?", Q2 = How careful would you be after seeing this icon?", Q3 = "What is the likelihood of encountering danger implied by this icon?", Q4 = "How attention-getting is this icon?", Q5 = " If you were browsing the Internet and you saw this icon, how likely would you be to avoid the website where you saw it?" All correlations are statistically significant at the .01 level using the Benjamini –Hochberg correction.

Table 16

Means and standard errors for adults for icons for understandability, carefulness, likelihood of danger, attention-getting, and likelihood of avoidance (control condition excluded) in Study 2

Measure	Icon	*M*	*SD*
Understandability	Crying Baby	5.37	.161
	Prohibit	6.72	.136
	Boy	6.65	.138
	Thumb Down	6.19	.157
	No Children Under 18	6.58	.146
Carefulness	Crying Baby	5.84	.157
	Prohibit	6.78	.117
	Boy	6.63	.119
	Thumb Down	6.36	.133
	No Children Under 18	6.20	.158
Likelihood of encountering danger	Crying Baby	5.38	.152
	Prohibit	6.22	.117
	Boy	6.10	.121
	Thumb Down	5.99	.129
	No Children Under 18	6.02	.134
Attention-getting	Crying Baby	5.43	.133
	Prohibit	6.13	.112
	Boy	5.96	.117
	Thumb Down	5.64	.107
	No Children Under 18	6.19	.115
Likelihood of avoidance	Crying Baby	5.72	.165
	Prohibit	6.44	.138
	Boy	6.38	.152
	Thumb Down	6.29	.150
	No Children Under 18	5.95	.154

Table 17

Means and standard errors for adults for color for understandability, carefulness, likelihood of danger, attention-getting, and likelihood of avoidance (control condition excluded)

Measure	Color	*M*	*SD*
Understandability	Red	6.41	.128
	Black	6.20	.133
Carefulness	Red	6.45	.117
	Black	6.28	.120
Likelihood of encountering danger	Red	6.07	.112
	Black	5.81	.117
Attention-getting	Red	6.10	.102
	Black	5.63	.105
Likelihood of avoidance	Red	6.18	.135
	Black	6.13	.141

Table 18

Means and standard deviations for adults for signal word for understandability, carefulness, likelihood of danger, attention-getting, and likelihood of avoidance (control condition excluded)

Measure	Signal Word	*M*	*SD*
Understandability	STOP	6.35	.131
	WARNING	6.25	.130
Carefulness	STOP	6.38	.117
	WARNING	6.35	.119
Likelihood of encountering Danger	STOP	5.93	.115
	WARNING	5.95	.112
Attention-getting	STOP	5.86	.100
	WARNING	5.87	.100
Likelihood of avoidance	STOP	6.23	.140
	WARNING	6.07	.136

Table 19

Means and standard errors for adults for warning messages for understandability, carefulness, likelihood of danger, attention-getting, and likelihood of avoidance (control condition excluded)

Measure	Message	*M*	*SD*
Understandability	Message 1	5.61	.138
	Message 2	6.36	.140
	Message 3	6.93	.151
Carefulness	Message 1	5.15	.148
	Message 2	6.40	.135
	Message 3	7.54	.128
Likelihood of encountering danger	Message 1	4.65	.130
	Message 2	5.95	.126
	Message 3	7.22	.137
Attention-getting	Message 1	4.94	.109
	Message 2	5.89	.109
	Message 3	6.77	.122
Likelihood of avoidance	Message 1	4.92	.153
	Message 2	6.21	.149
	Message 3	7.33	.155

Table 20

Means and standard deviations for icons for understandability, carefulness, likelihood of danger, attention-getting, and likelihood of avoidance (adults - control condition included)

Measure	Icon	*M*	*SD*
Understandability	Crying Baby	4.65	.095
	Prohibit	5.90	.087
	Boy	5.68	.085
	Thumb Down	5.28	.096
	No Children Under 18	5.75	.099
Carefulness	Crying Baby	4.84	.096
	Prohibit	5.74	.081
	Boy	5.56	.082
	Thumb Down	5.50	.084
	No Children Under 18	5.50	.100
Likelihood of encountering danger	Crying Baby	4.50	.089
	Prohibit	5.20	.075
	Boy	5.07	.075
	Thumb Down	5.07	.077
	No Children Under 18	5.24	.084
Attention-getting	Crying Baby	4.69	.080
	Prohibit	5.17	.076
	Boy	5.13	.075
	Thumb Down	5.04	.072
	No Children Under 18	5.71	.077
Likelihood of avoidance	Crying Baby	4.83	.098
	Prohibit	5.46	.090
	Boy	5.31	.094
	Thumb Down	5.38	.093
	No Children Under 18	5.31	.098

Note. N = 271

Table 21

Means and standard deviations for signal word for understandability, carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance (adults - control condition included)

Measure	Signal Word	*M*	*SD*
Understandability	Control (no signal word)	4.93	.084
	STOP	5.77	.083
	WARNING	5.66	.081
Carefulness	Control (no signal word)	5.00	.082
	STOP	5.66	.078
	WARNING	5.62	.077
Likelihood of encountering danger	Control (no signal word)	4.64	.074
	STOP	5.16	.073
	WARNING	5.24	.071
Attention-getting	Control (no signal word)	4.59	.070
	STOP	5.39	.067
	WARNING	5.46	.066
Likelihood of avoidance	Control (no signal word)	4.87	.089
	STOP	5.50	.089
	WARNING	5.41	.085

Note. N = 271

Table 22

Means and standard deviations for warning message for understandability, carefulness, likelihood of encountering danger, attention-getting, and likelihood of avoidance (adults - control condition included)

Measure	Warning Message	*M*	*SD*
Understandability	Control (no message)	3.68	.096
	Message 1	5.27	.097
	Message 2	6.12	.096
	Message 3	6.75	.103
Carefulness	Control (no message)	3.05	.087
	Message 1	5.10	.104
	Message 2	6.22	.093
	Message 3	7.34	.094
Likelihood of encountering danger	Control (no message)	2.64	.072
	Message 1	4.53	.096
	Message 2	5.78	.091
	Message 3	7.11	.097
Attention-getting	Control (no message)	3.47	.078
	Message 1	4.74	.082
	Message 2	5.79	.076
	Message 3	6.58	.085
Likelihood of avoidance	Control (no message)	3.17	.093
	Message 1	4.81	.106
	Message 2	6.01	.103
	Message 3	7.03	.106

Note. N = 271

Table 23

Means and standard deviations for understandability and likelihood of avoidance for signal words (children—control condition excluded)

Measure	Signal Word	*M*	*SD*
Understandability	STOP	6.42	.532
	WARNING	6.17	.621
Likelihood of avoidance	STOP	6.21	.400
	WARNING	5.97	.431

Table 24

Means and standard deviations for understandability and likelihood of avoidance for warning message (children – control condition excluded)

Measure	Message	*M*	*SD*
Understandability	Message 1	5.68	.560
	Message 2	6.40	.618
	Message 3	6.82	.632
Likelihood of avoidance	Message 1	5.86	.307
	Message 2	7.00	.494
	Message 3	5.40	.570

Table 25

Means and standard deviations for understandability and likelihood of avoidance for signal word (children – control condition included)

Measure	Signal Word	*M*	*SD*
Understandability	Control (no signal word)	5.28	.543
	STOP	6.08	.500
	WARNING	5.67	.518
Likelihood of Avoidance	Control (no signal word)	6.02	.328
	STOP	5.98	.333
	WARNING	5.75	.329

Table 26

Means and deviations errors for understandability and likelihood of avoidance for icons (children—control condition included)

Measure	Icon	*M*	*SD*
Understandability	Crying Baby	4.96	.638
	Prohibit	6.06	.596
	Boy	6.12	.467
	Thumb Down	5.64	.653
	No Children Under 18	5.60	.454
Likelihood of Avoidance	Crying Baby	5.72	.309
	Prohibit	5.88	.230
	Boy	6.14	.296
	Thumb Down	5.78	.663
	No Children Under 18	6.07	.537

Table 27

Means and standard deviations for understandability and likelihood of avoidance for warning message (children – control condition included)

Measure	Warning Message	*M*	*SD*
Understandability	Control (no message)	3.90	.534
	Message 1	5.61	.527
	Message 2	6.40	.600
	Message 3	6.80	.605
Likelihood of Avoidance	Control (no message)	4.96	.422
	Message 1	6.21	.380
	Message 2	7.15	.438
	Message 3	5.35	.492
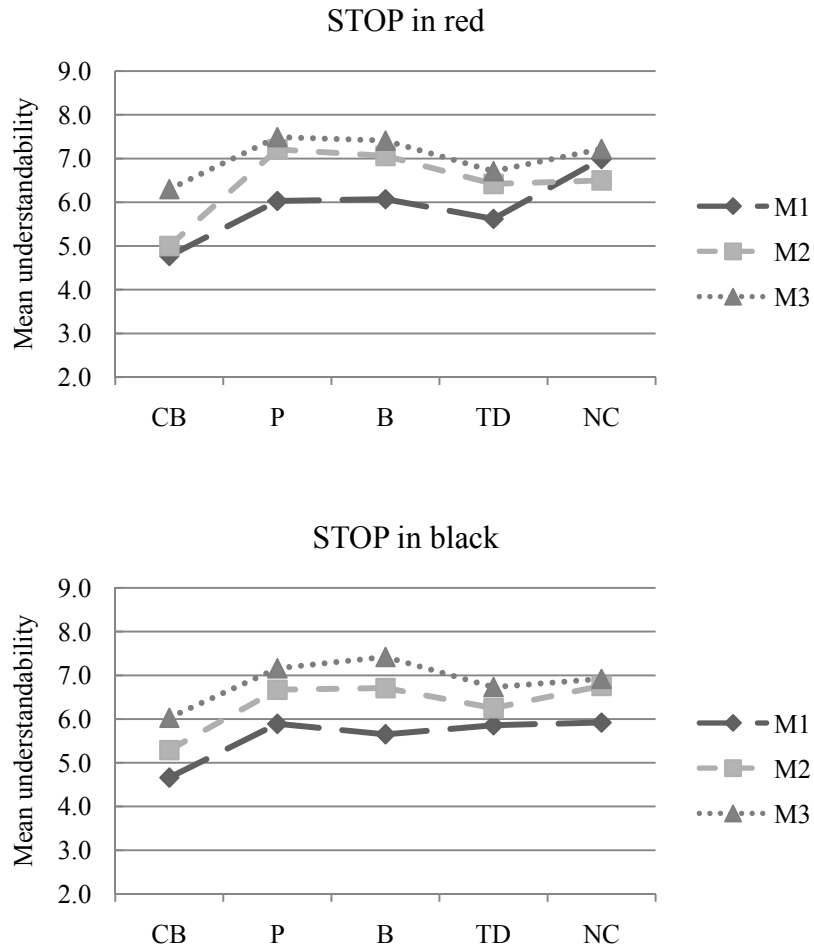
Figure 6. Icon x color x signal word x warning message interaction for the signal word STOP for understandability: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
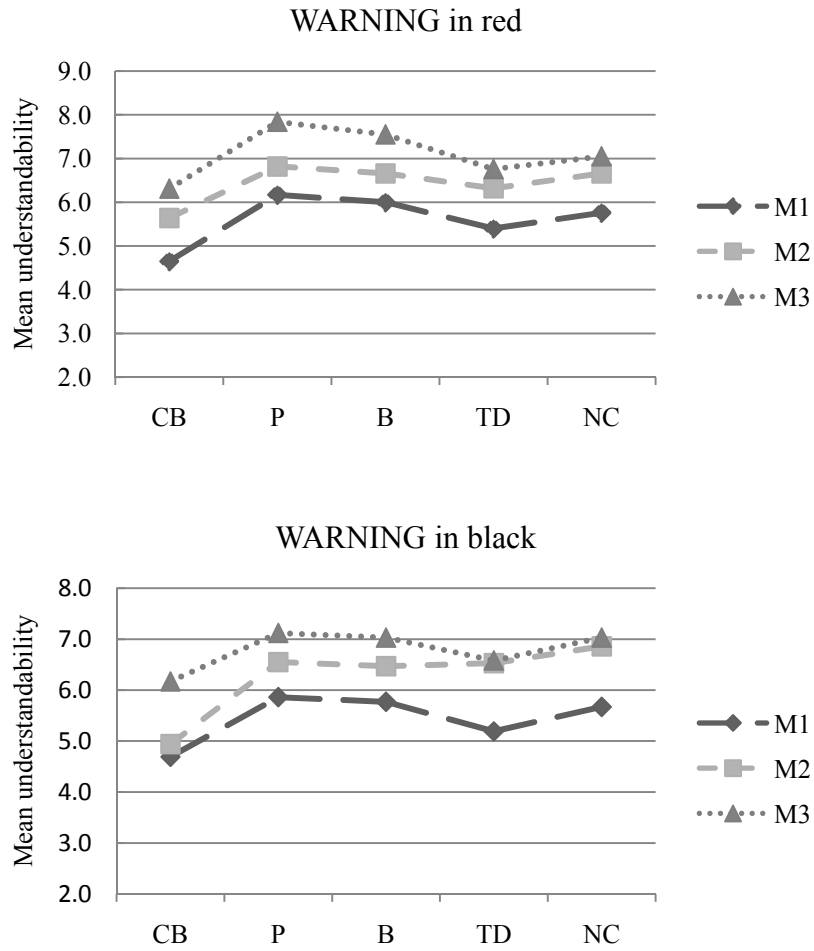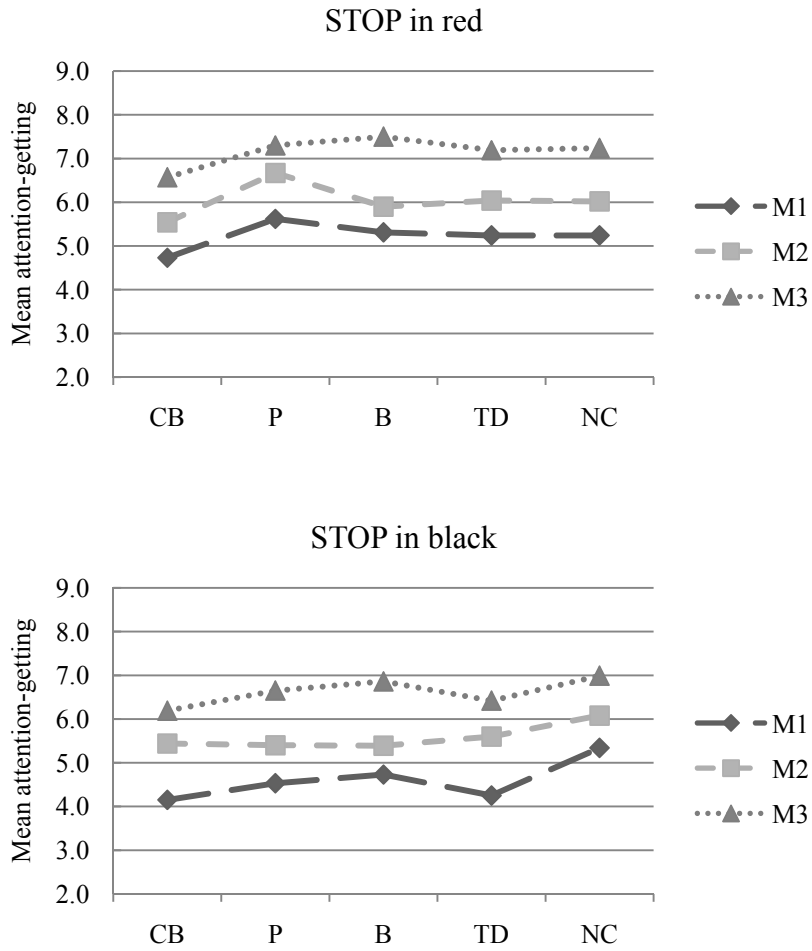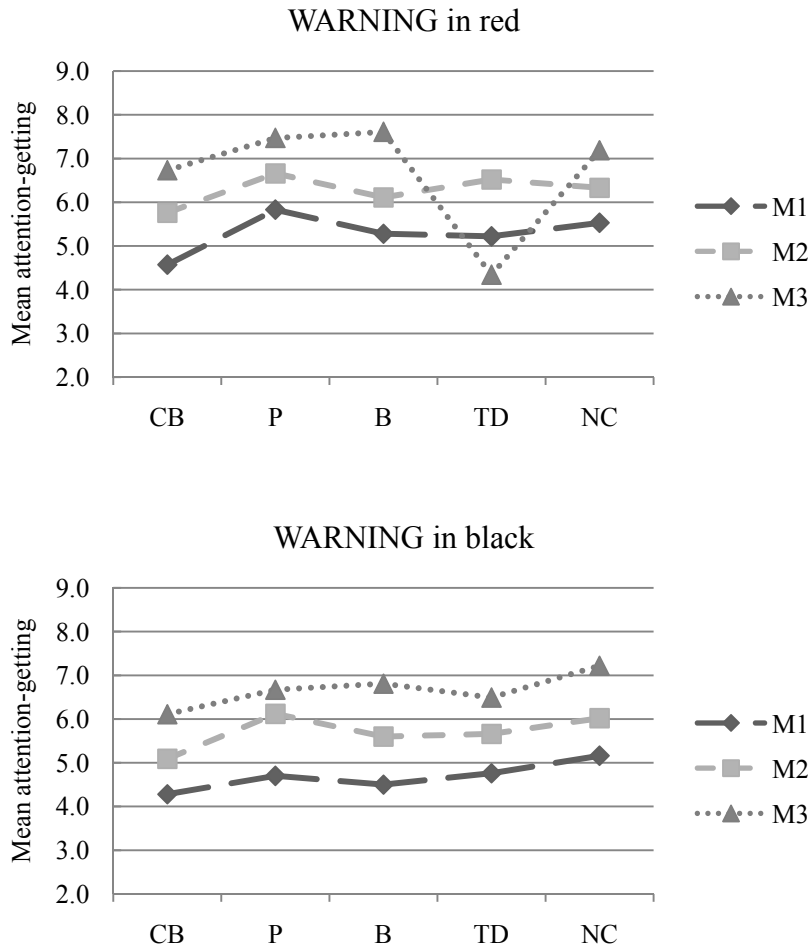
Figure 7. Icon x color x signal word x warning message interaction for the signal word WARNING for understandability: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
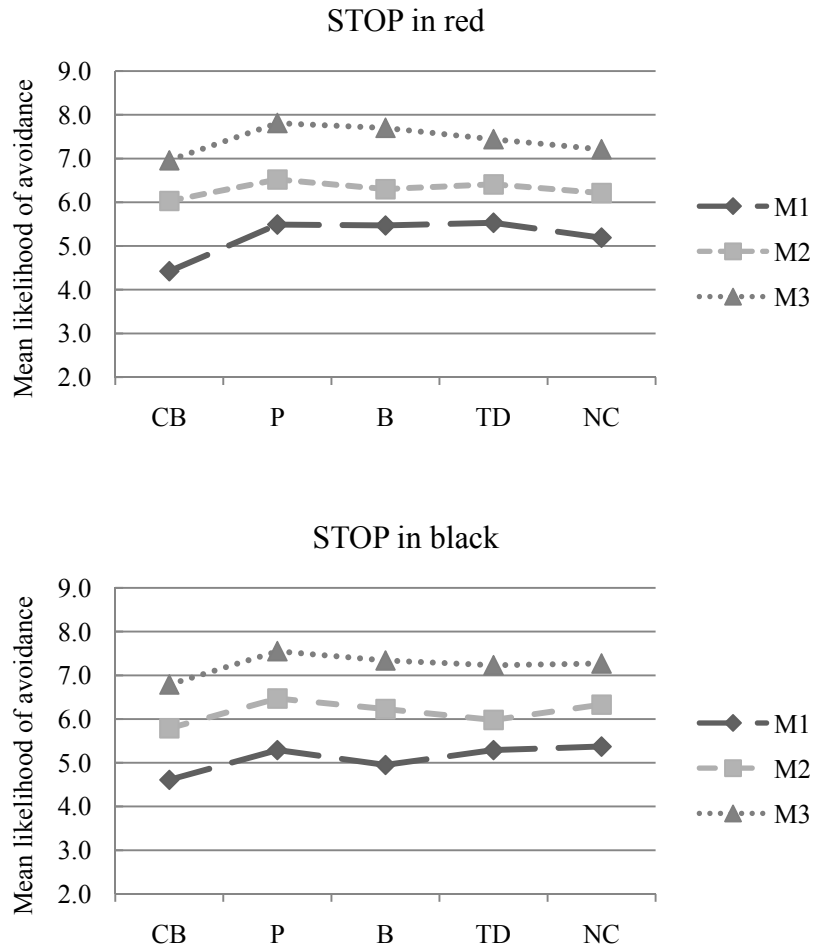
STOP in red

STOP in black
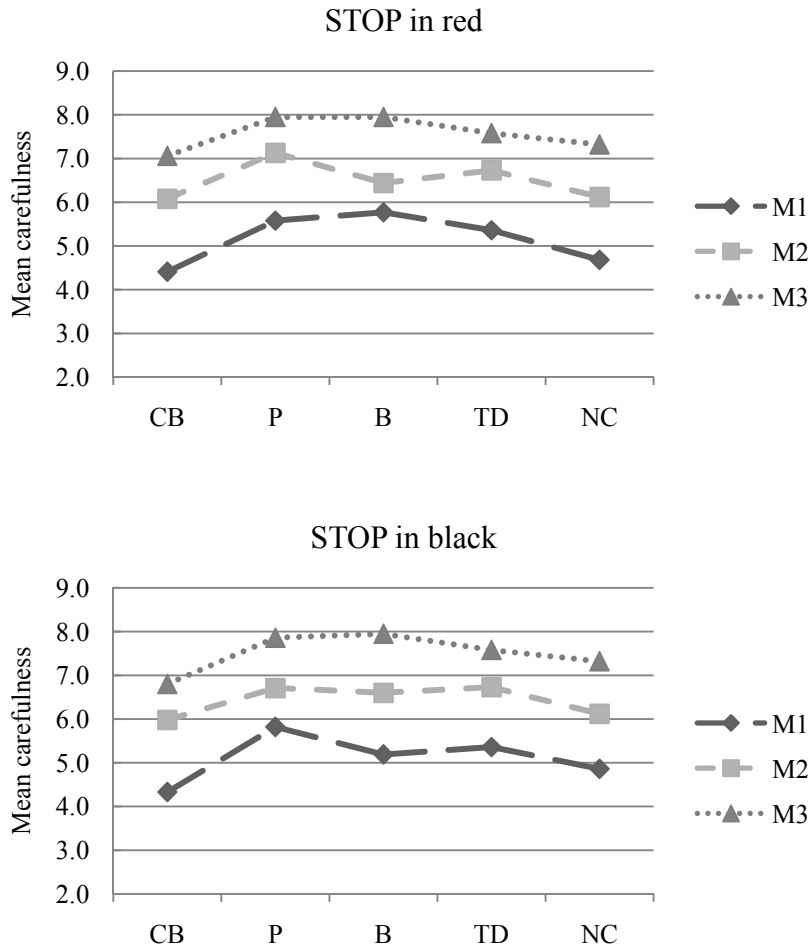
Figure 8. Icon x color x signal word x warning message interaction for the signal word STOP for carefulness: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

WARNING in red

WARNING in black
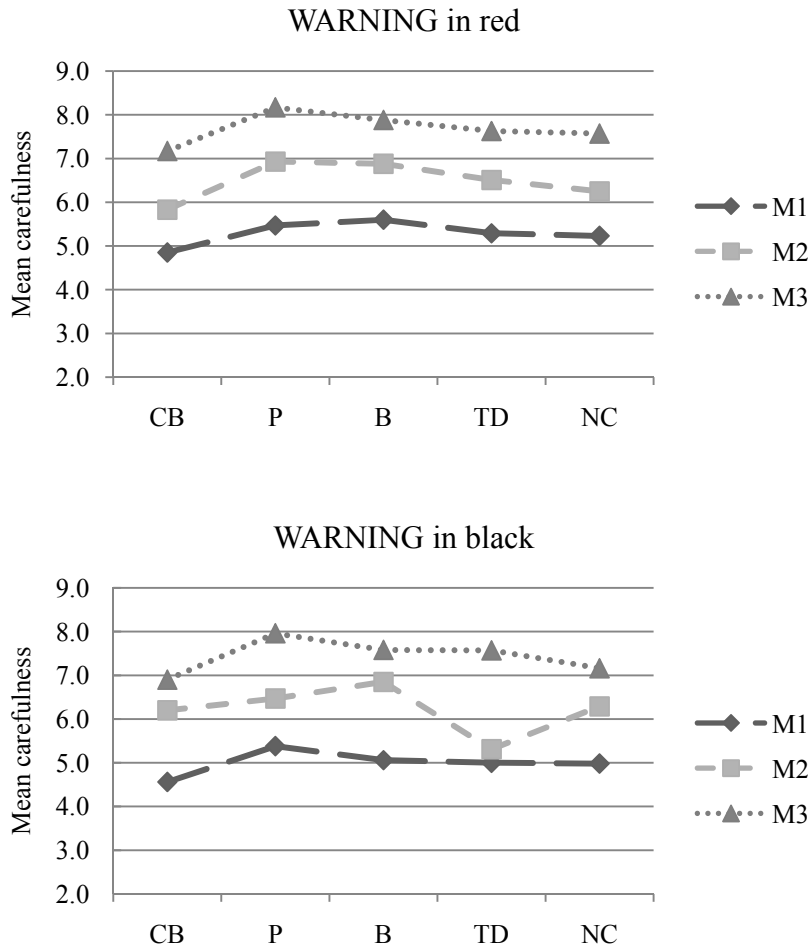
Figure 9. Icon x color x signal word x warning message interaction for the signal word WARNING for carefulness: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
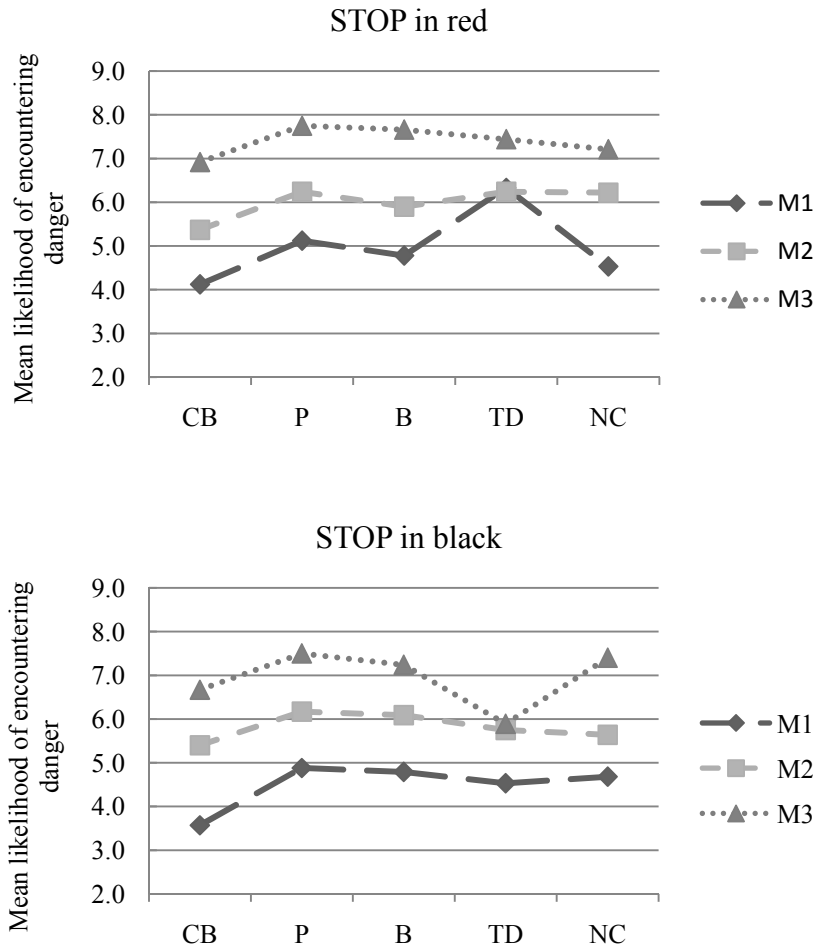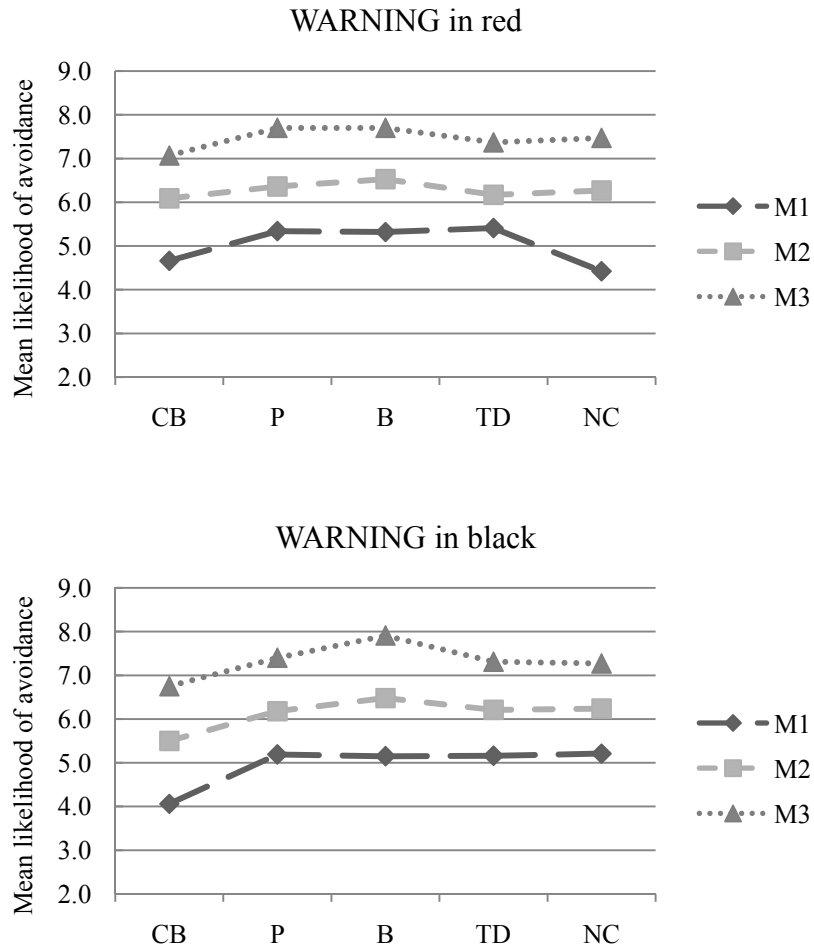
Figure 10. Icon x color x signal word x warning message interaction for the signal word STOP for likelihood of encountering danger: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
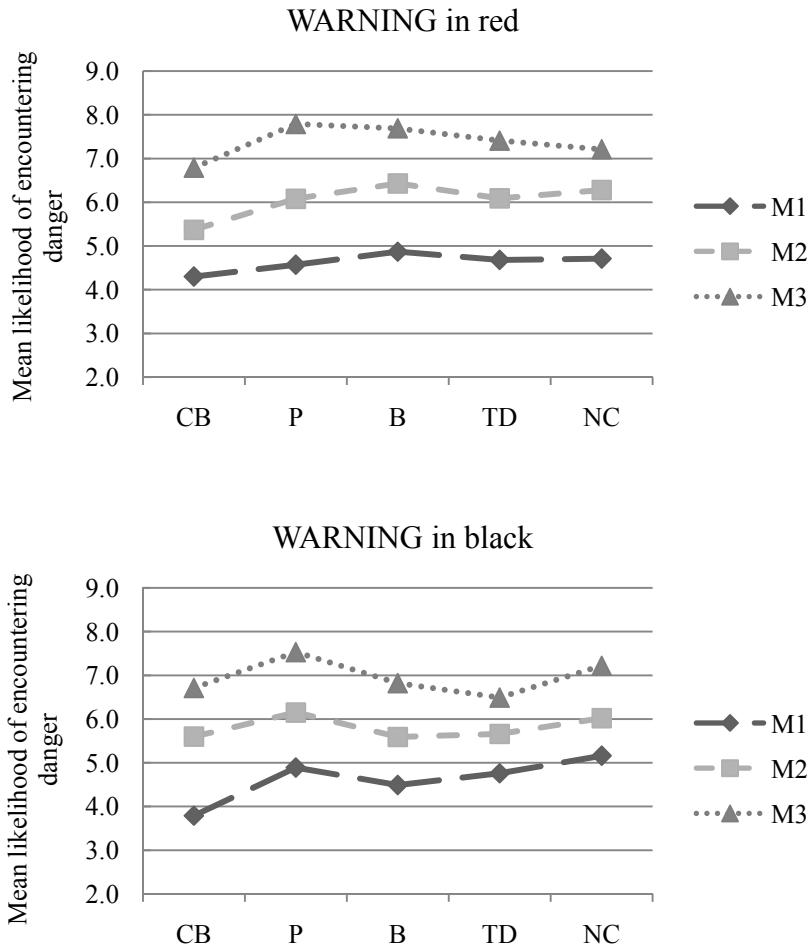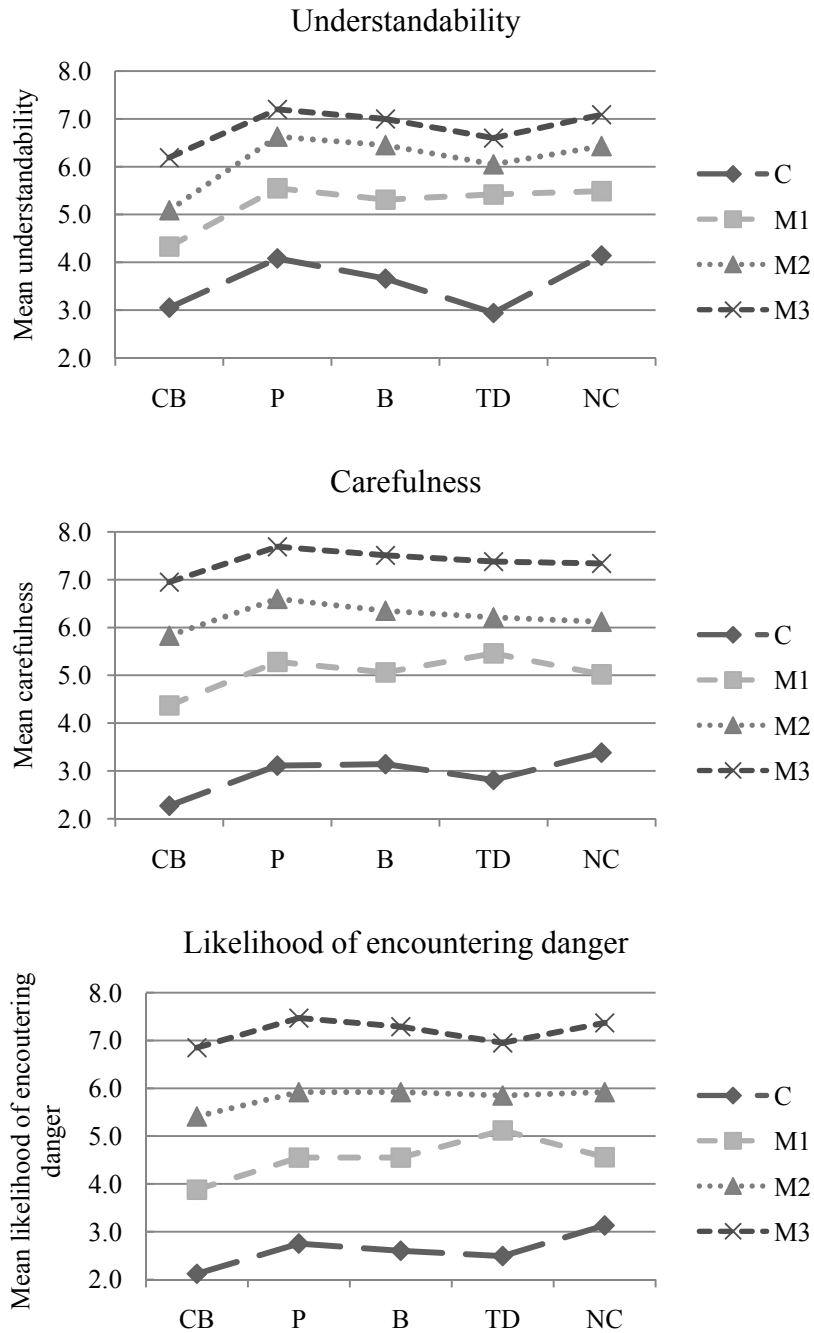
Figure 11. Icon x color x signal word x warning message interaction for the signal word WARNING for likelihood of encountering danger: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

STOP in red

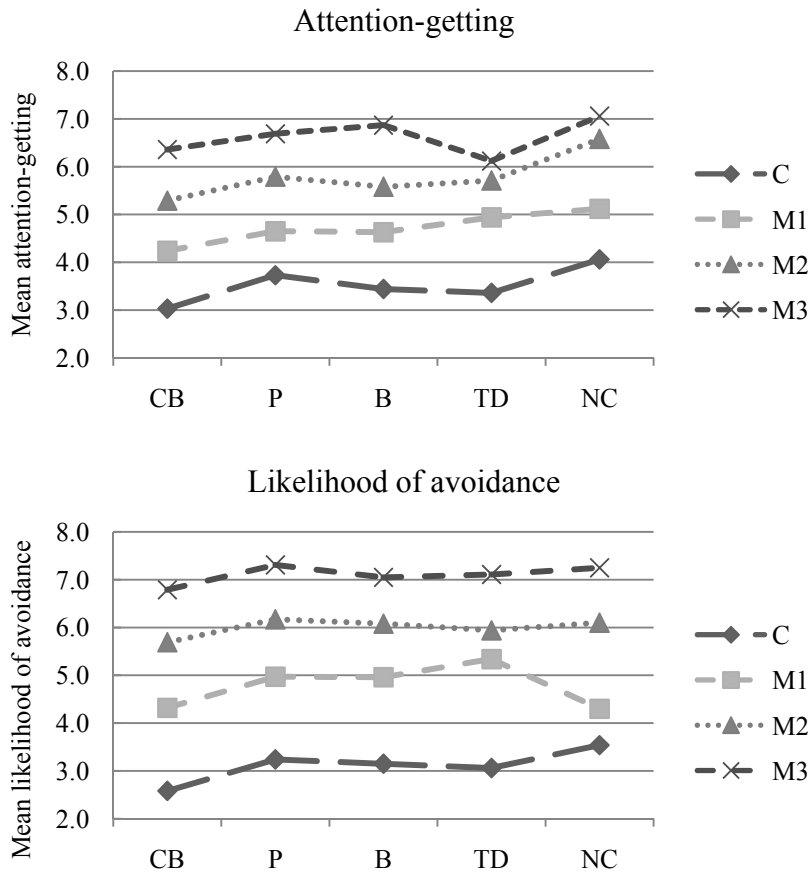**STOP in black**

Figure 12. Icon x color x signal word x warning message interaction for the signal word STOP for attention-getting: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

Figure 13. Icon x color x signal word x warning message interaction for the signal word WARNING for attention-getting: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
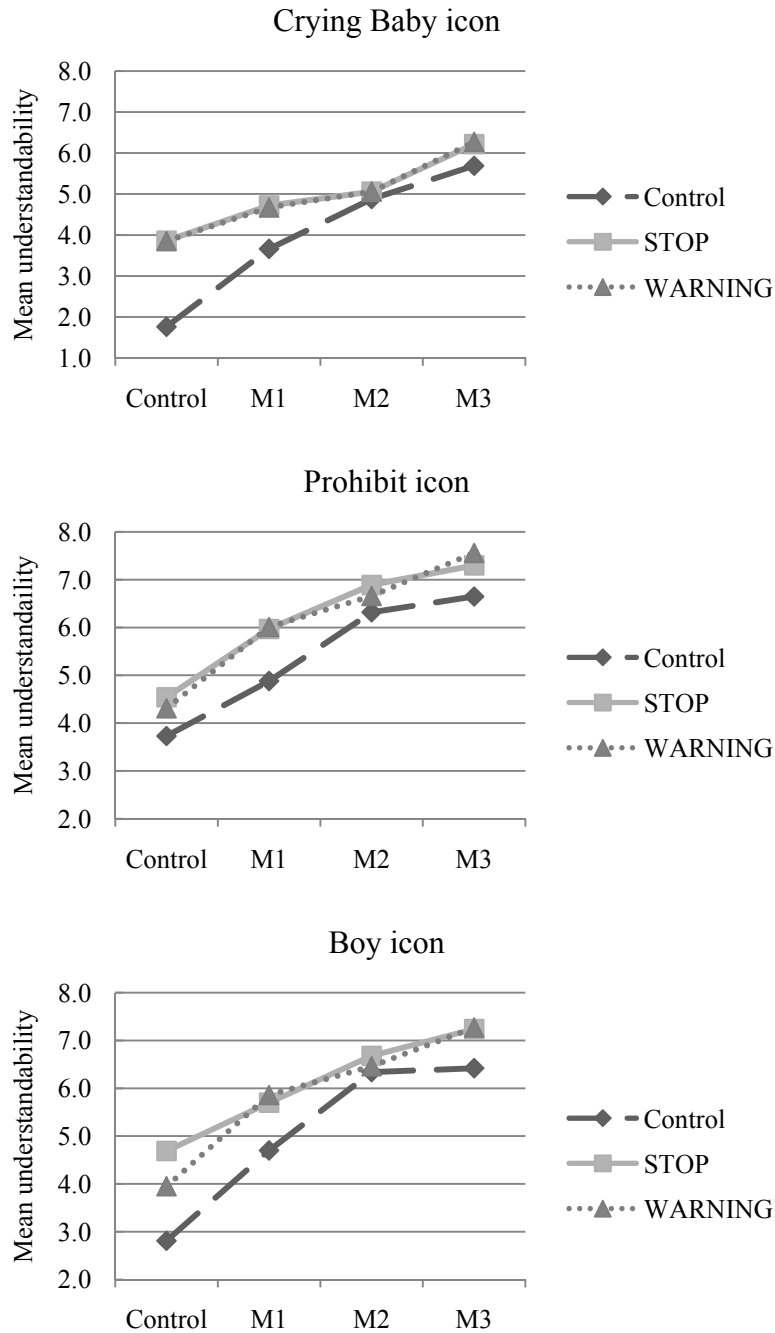
Figure 14. Icon x color x signal word x warning message interaction for the signal word STOP for likelihood of avoidance: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

Figure 15. Icon x color x signal word x warning message interaction for the signal word WARNING for likelihood of avoidance: message at icon adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

Figure 16. Icon x color x signal word x warning message: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. C = control (no message), M1 = message 1, M2 = message 2, M3 = message 3.

Attention-getting

Likelihood of avoidance

Figure 17. Icon x color x signal word x warning message: message at icon (adults – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. C = Control (no message), M1 = message 1, M2 = message 2, M3 = message 3.

Figure 18. Icon x signal word x warning message interaction for understandability: signal word at warning message (adults - control condition included, collapsed across color). M1= message 1, M2 = message 2, M3 = message 3.
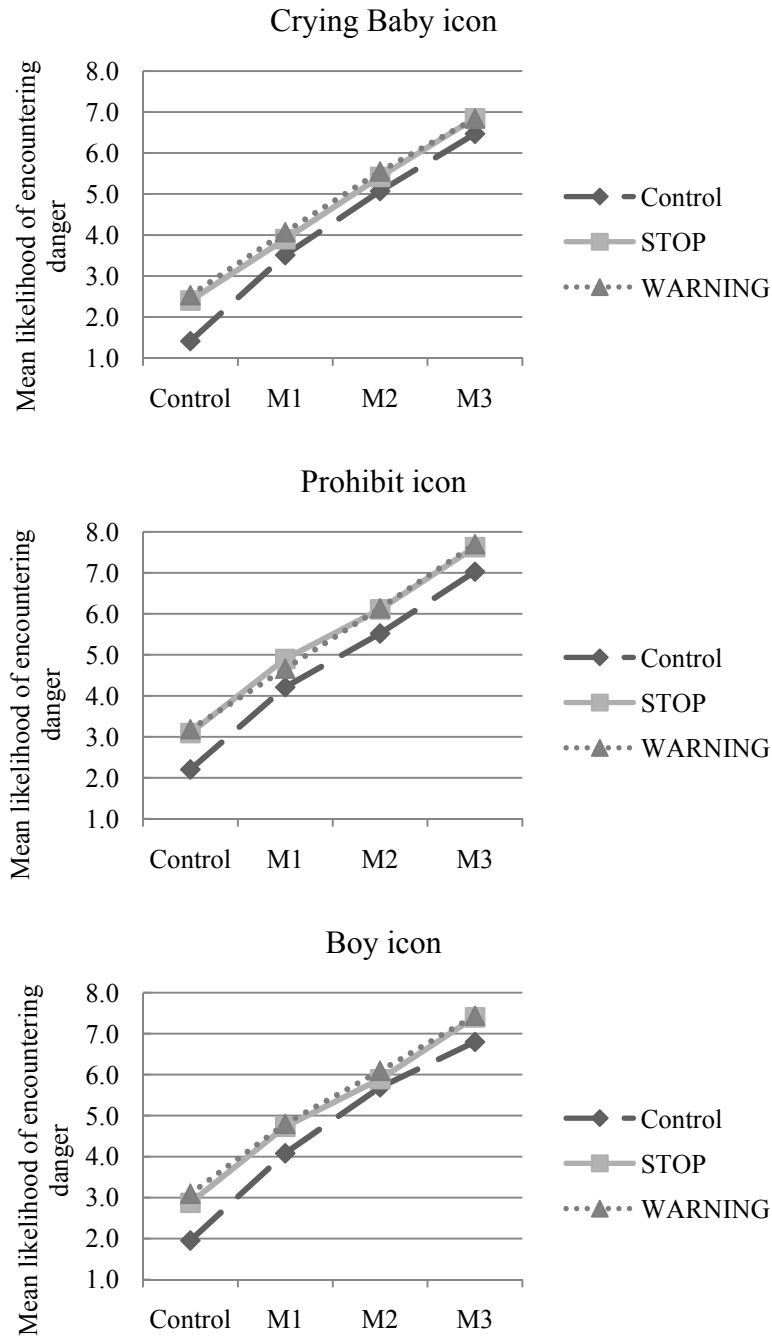
Thumb Down icon

No Children Under 18 icon
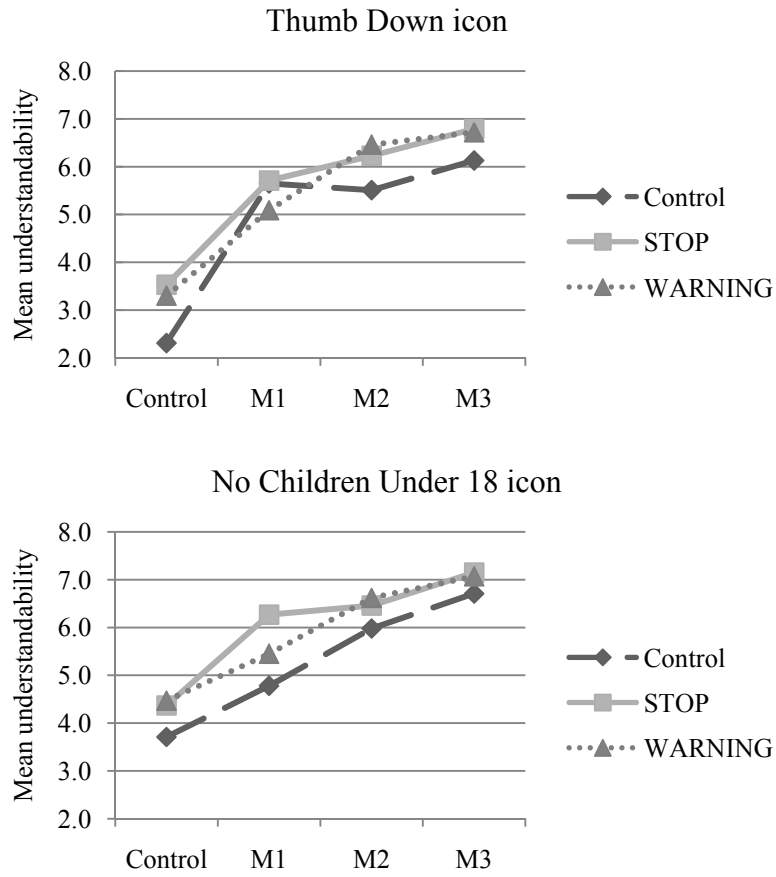
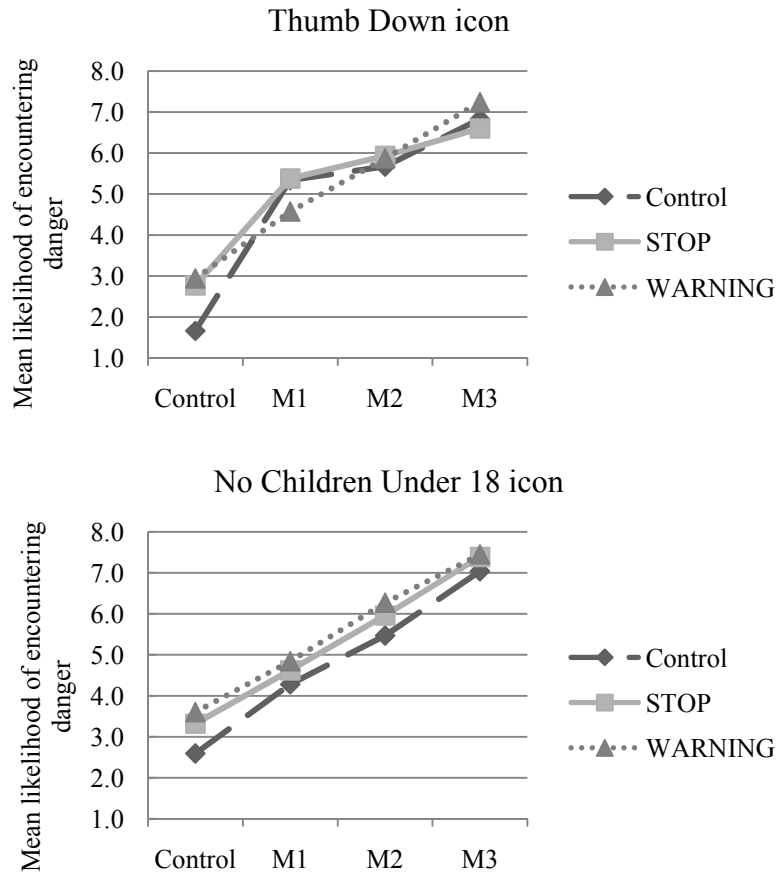*Figure* 19. Icon x signal word x warning message interaction for understandability: signal word at warning message (adults - control condition included, collapsed across color).

Crying Baby icon

Prohibit icon

Boy icon
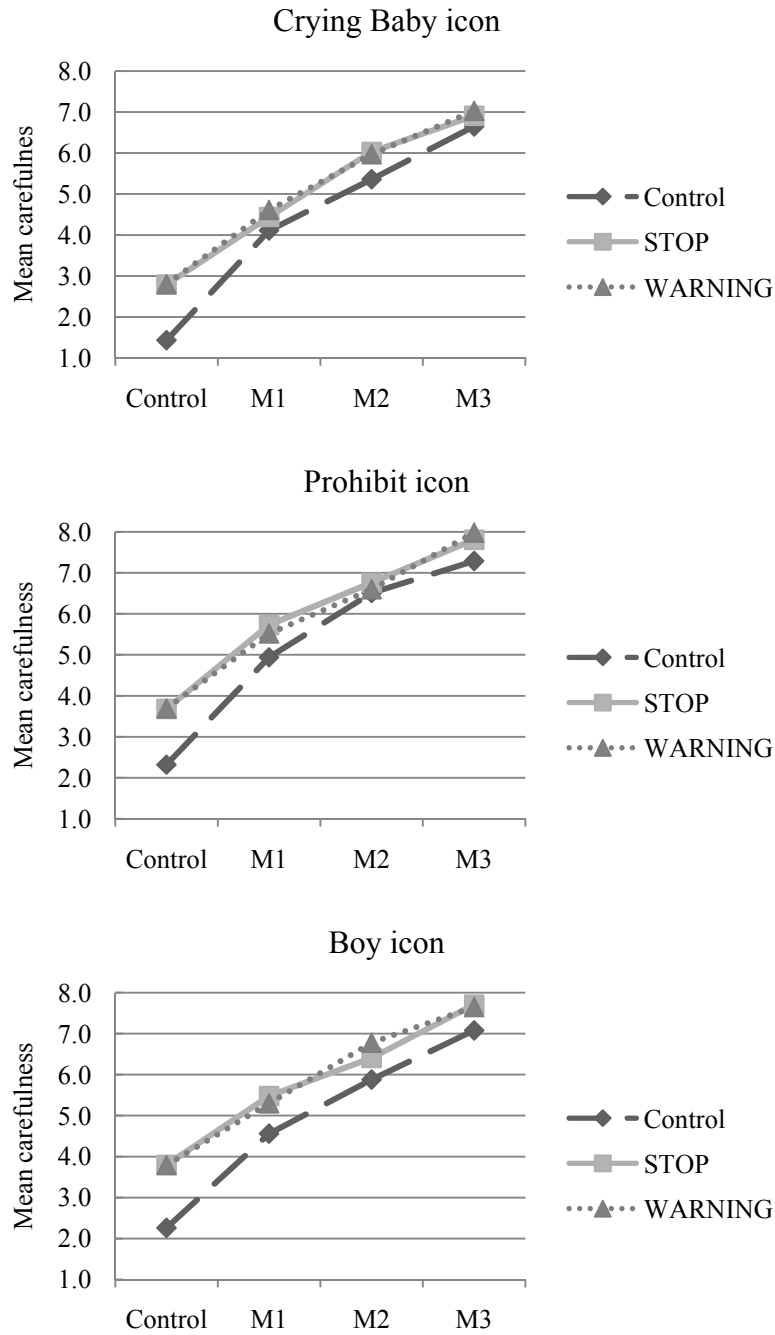
Figure 20. Icon x signal word x warning message interaction for carefulness: signal word at warning message (adults - control condition included, collapsed across color).
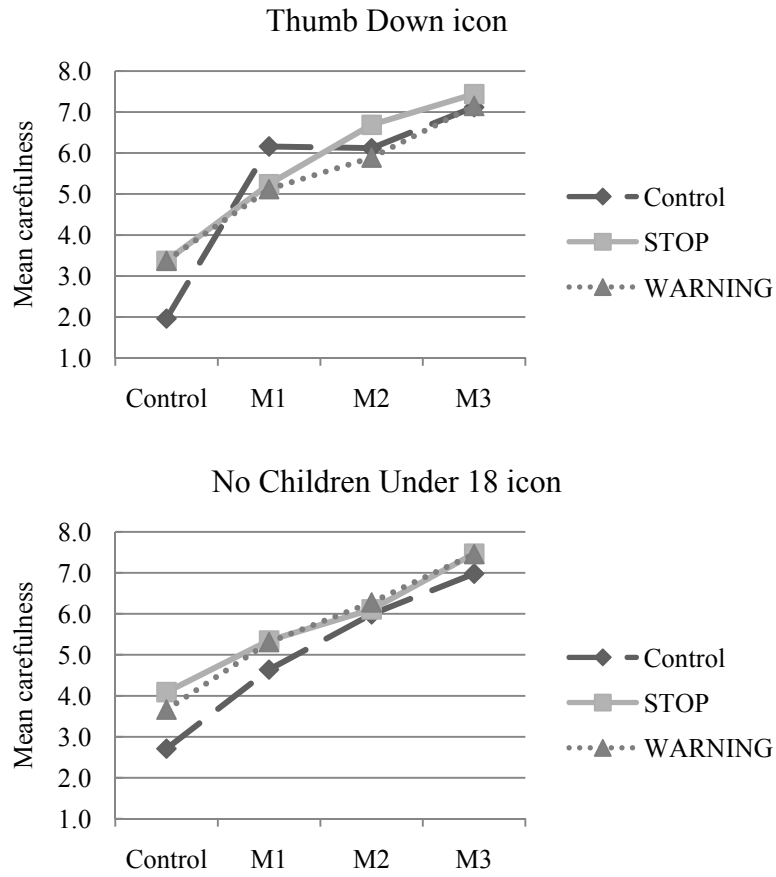
Figure 21. Icon x signal word x warning message interaction for carefulness: signal word at warning message (adults - control condition included, collapsed across color).

Crying Baby icon

Prohibit icon

Boy icon

Figure 22. Icon x signal word x warning message interaction for likelihood of encountering danger: signal word at warning (adults - control condition included, collapsed across color).
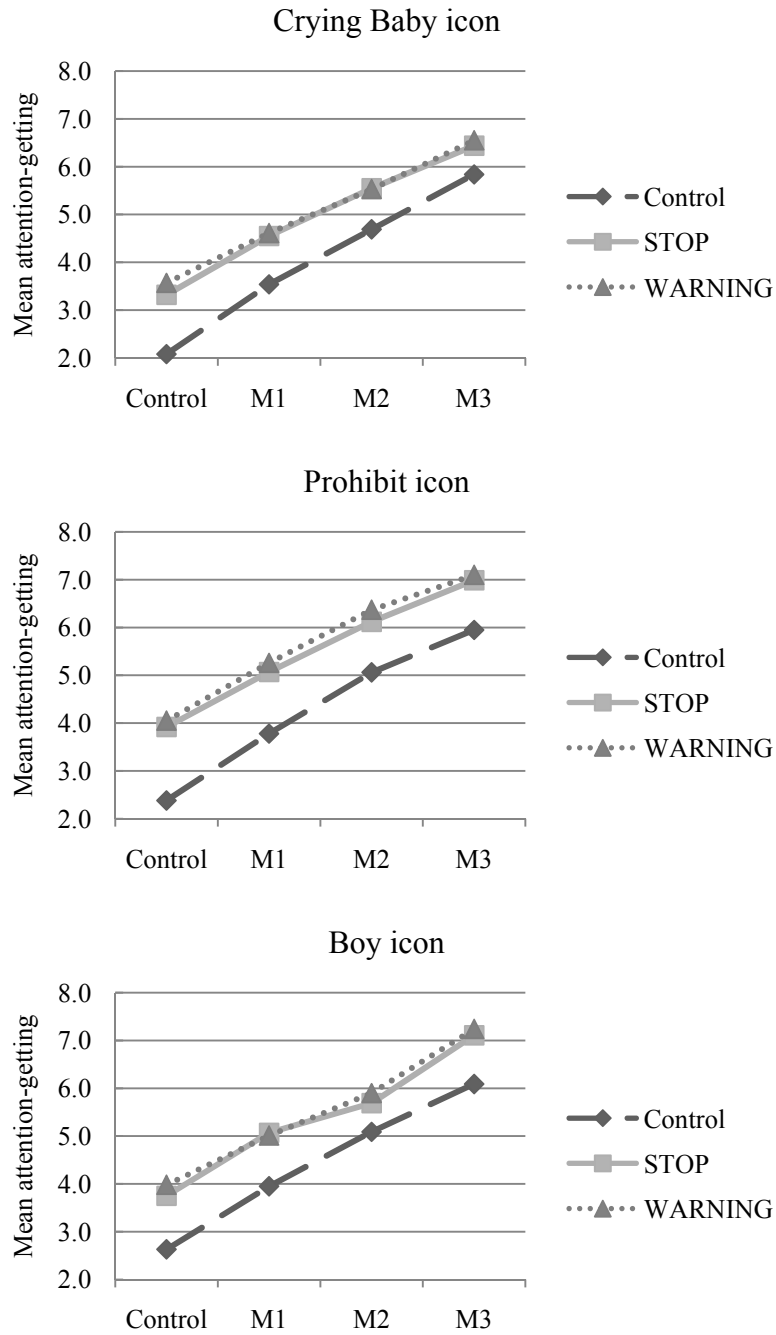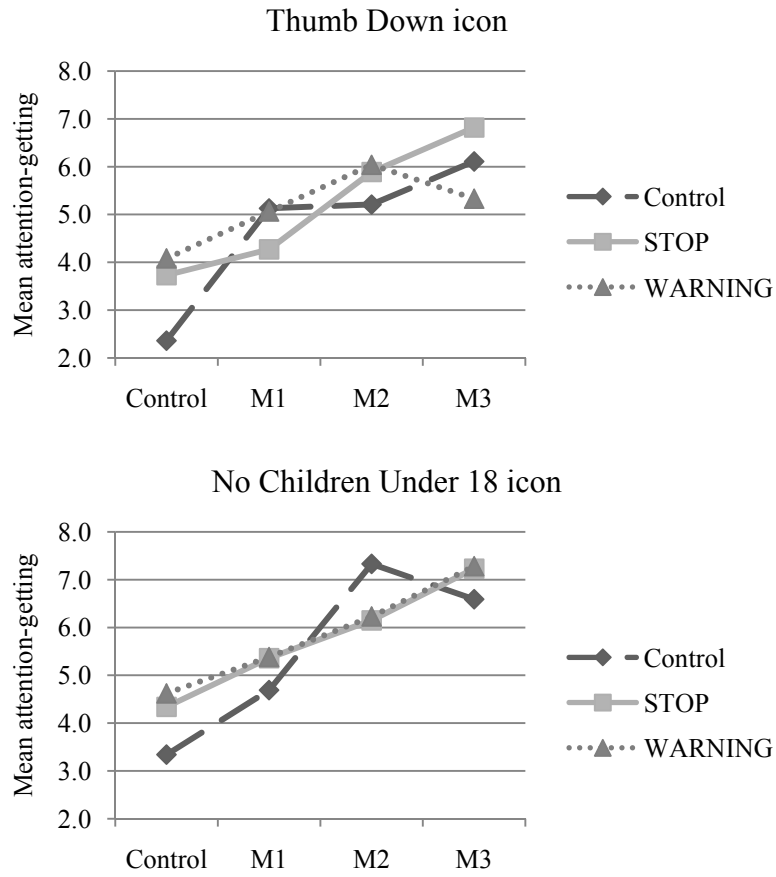
Thumb Down icon

No Children Under 18 icon

Figure 23. Icon x signal word x warning message interaction for likelihood of encountering danger: signal word at warning message (adults - control condition included, collapsed across color).

Crying Baby icon

Prohibit icon

Boy icon

Figure 24. Icon x signal word x warning message interaction for attention-getting: signal word at warning message (adults - control condition included, collapsed across color).

Thumb Down icon

No Children Under 18 icon

Figure 25. Icon x signal word x warning message interaction for attention-getting: signal word at message (adults - control condition included, collapsed across color).
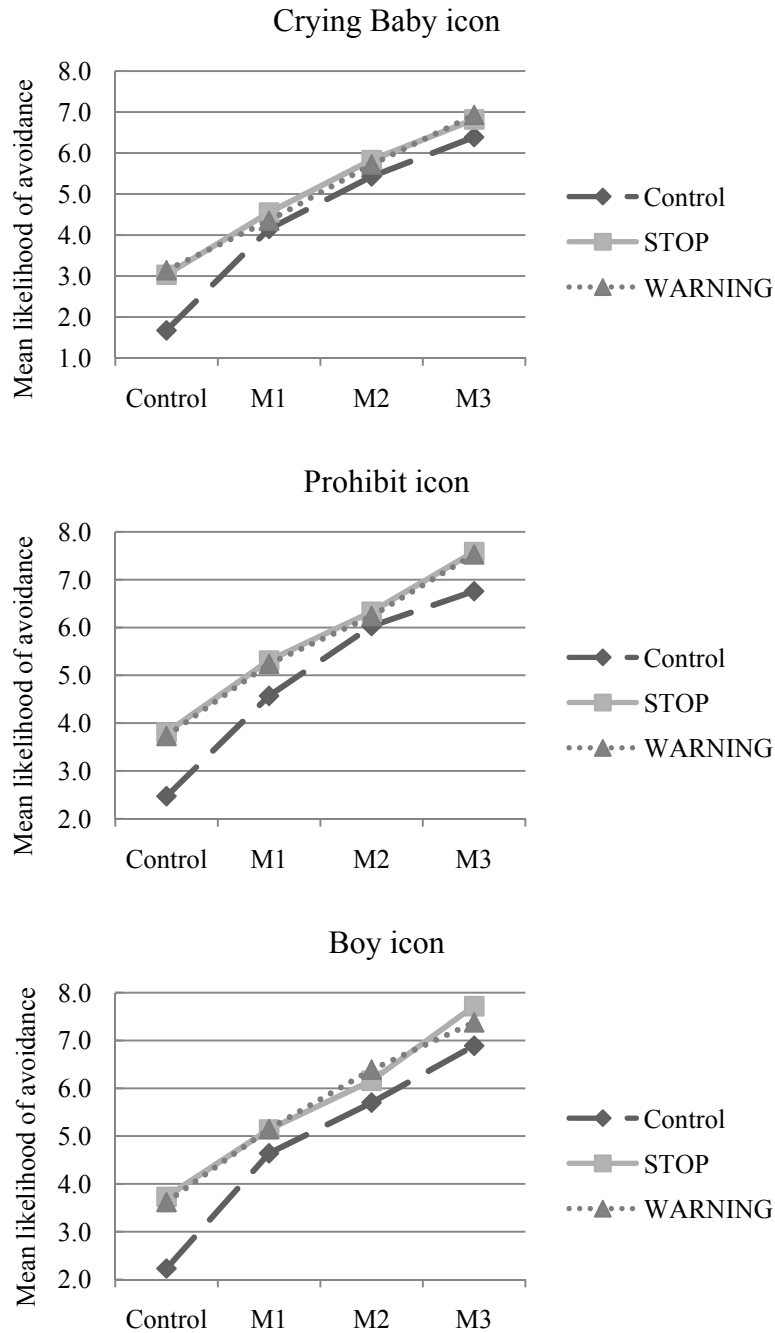
Figure 26. Icon x signal word x warning message interaction for likelihood of avoidance: signal word at warning message adults - control condition included, collapsed across color).
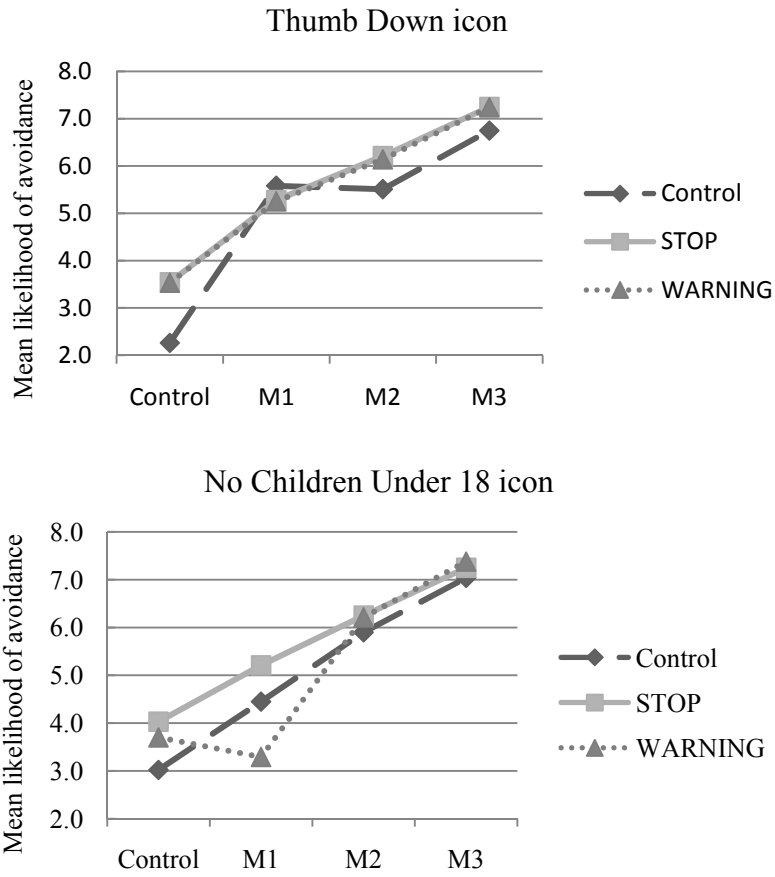
Figure 27. Icon x signal word x warning message interaction for likelihood of avoidance: signal word at warning message (adults - control condition included, collapsed across color).
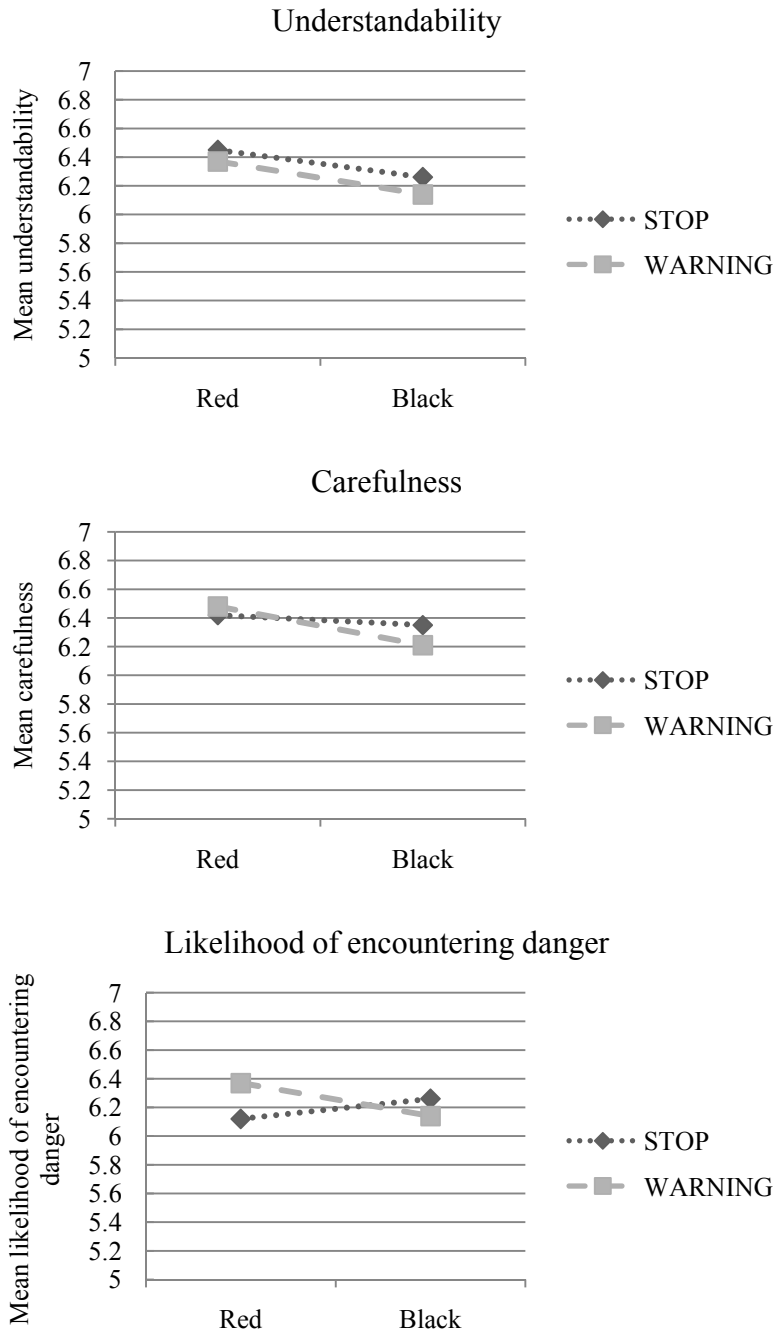
Understandability

Carefulness

Likelihood of encountering danger

Figure 28. Color x signal word interaction (adults – control condition excluded) for understandability, carefulness, and likelihood of encountering danger.
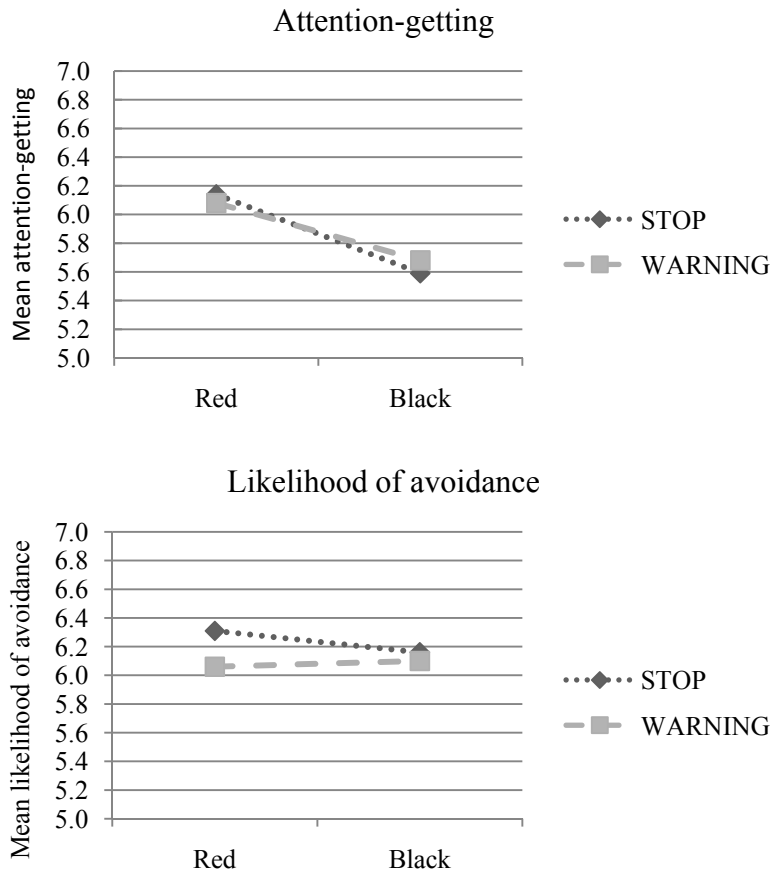
299

Attention-getting

Likelihood of avoidance

Figure 29. Color x signal word interaction (adults – control condition excluded) for attention-getting and likelihood of avoidance.
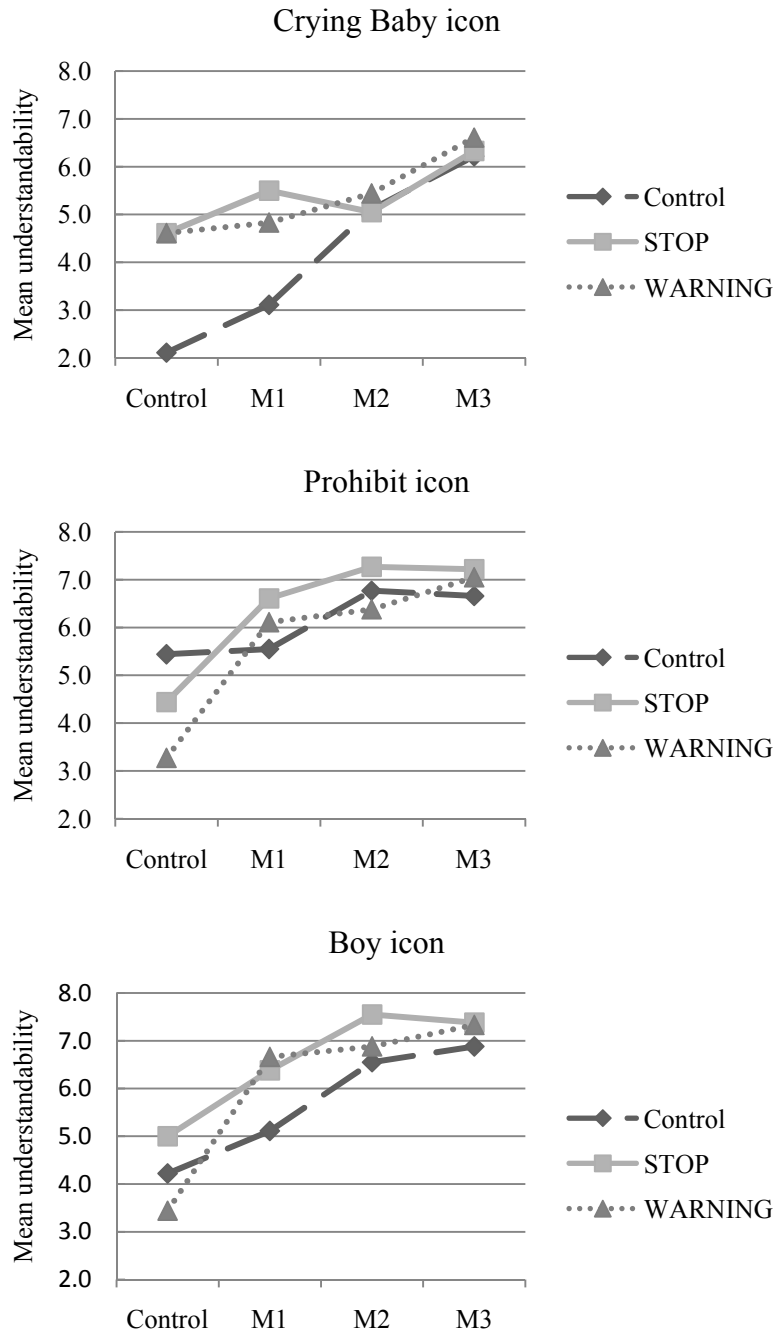
Figure 30. Icon x signal word x warning message interaction for understandability: signal word at warning message (children - control condition included).
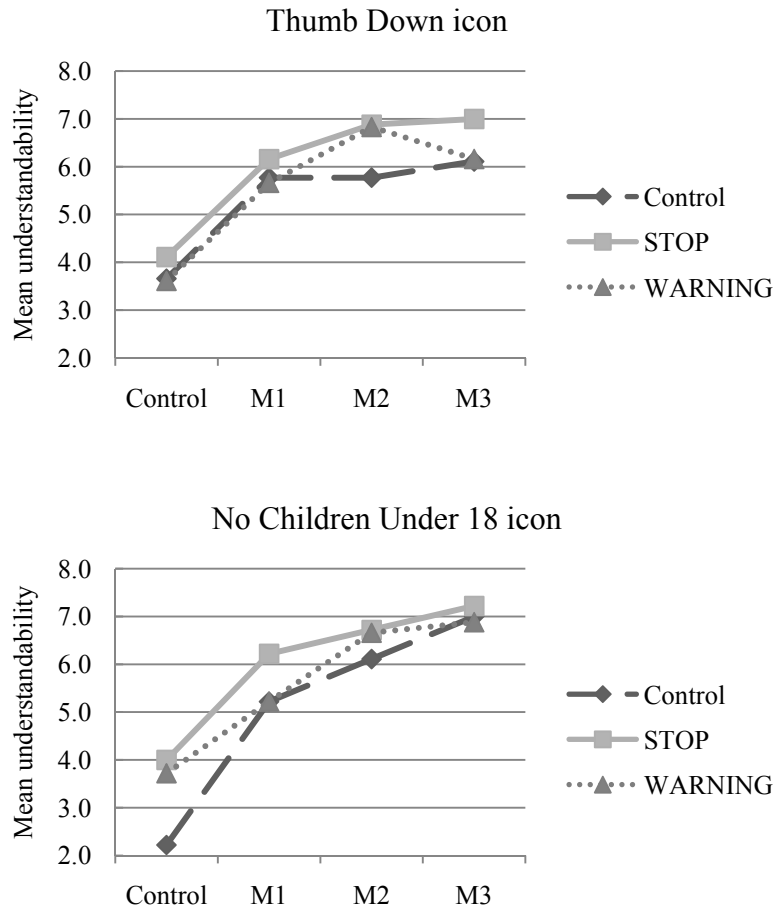
Thumb Down icon

No Children Under 18 icon

Figure 31. Icon x signal word x warning message interaction for understandability: signal word at warning message (children - control condition included).
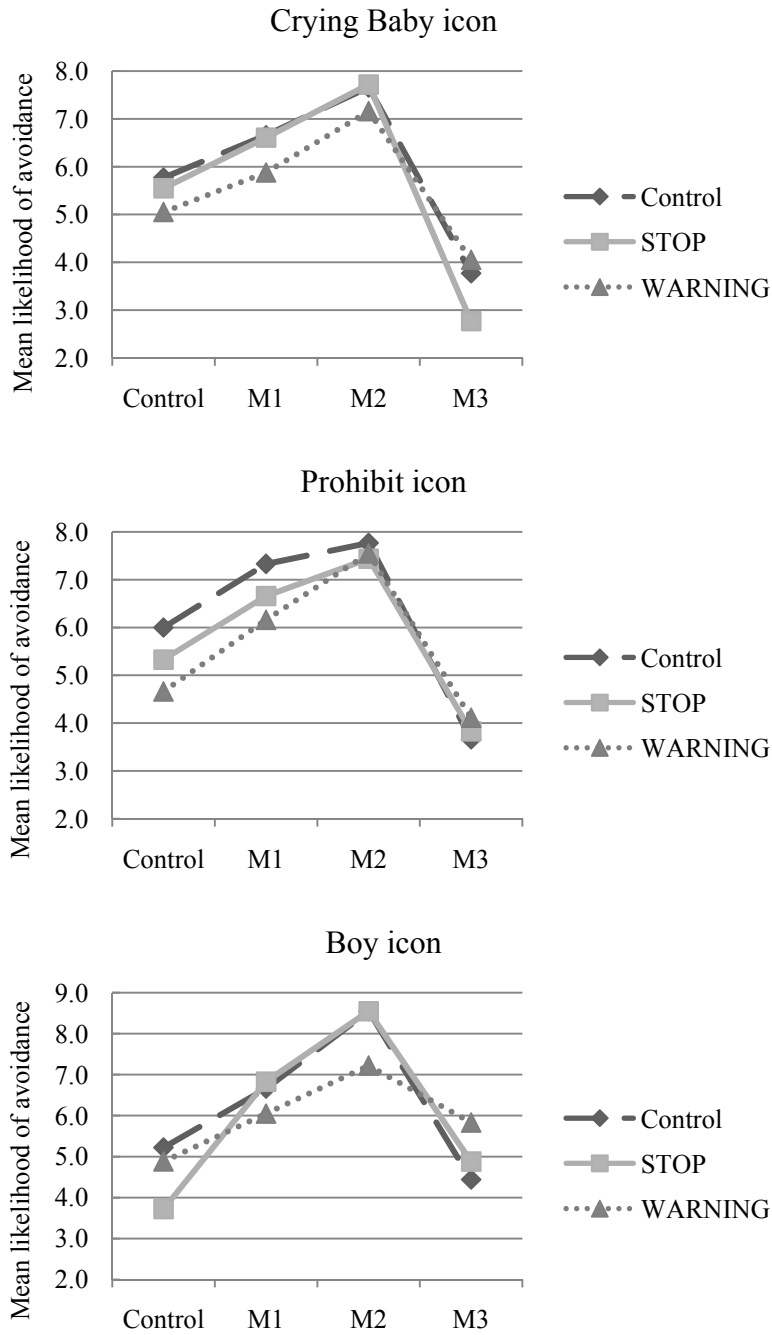
Figure 32. Icon x signal word x warning message interaction for likelihood of avoidance: signal word at warning message (children- control condition included).
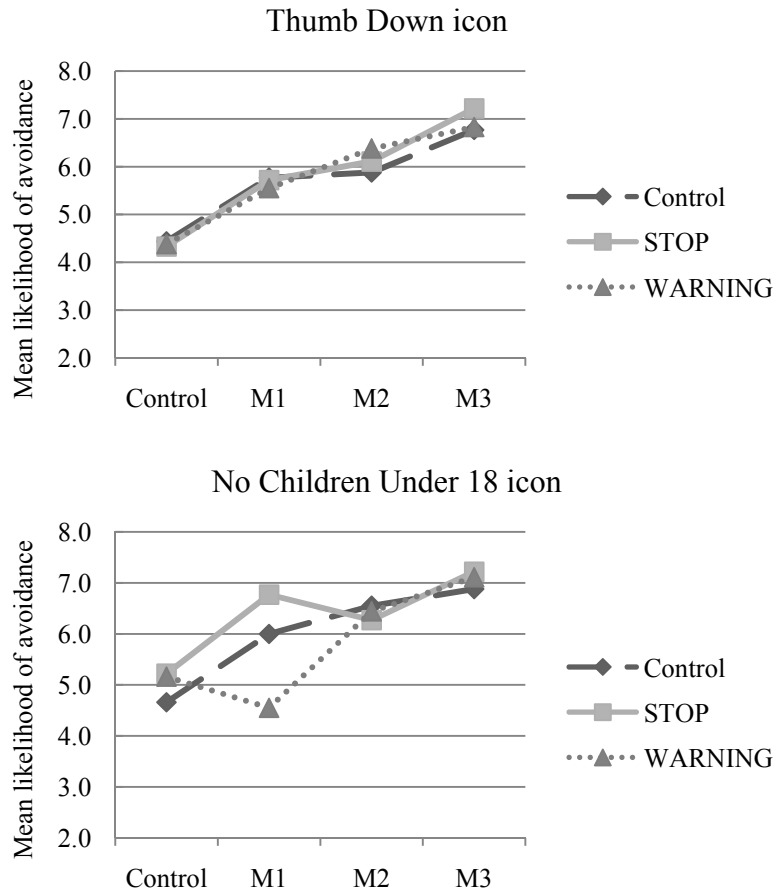
Figure 33. Icon x signal word x warning message interaction for likelihood of avoidance: signal word at warning message (children - control condition included). (a) Thumb Down icon, (b) No Children Under 18 icon.
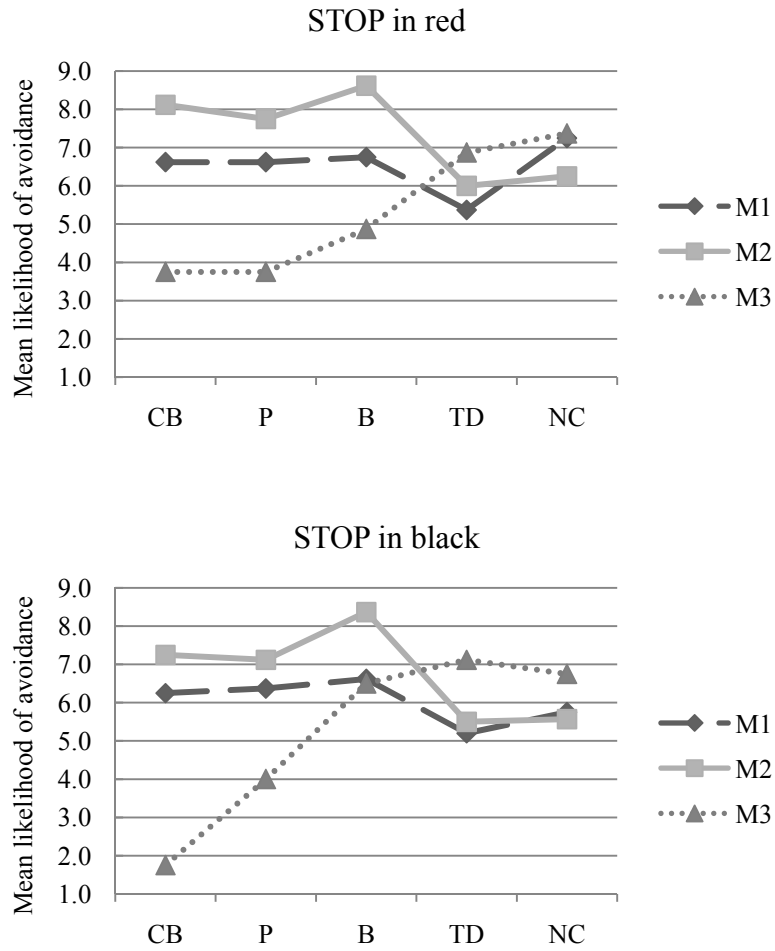
Figure 34. Icon x color x signal word x warning message interaction for the signal word STOP for likelihood of avoidance: message at icon (children – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.

Figure 35. Icon x color x signal word x warning message interaction for the signal word WARNING for likelihood of avoidance: message at icon (children – control condition excluded). CB = Crying Baby, *p* = Prohibit, B = Boy, TD = Thumb Down, NC = No Children Under 18. M1 = message 1, M2 = message 2, M3 = message 3.
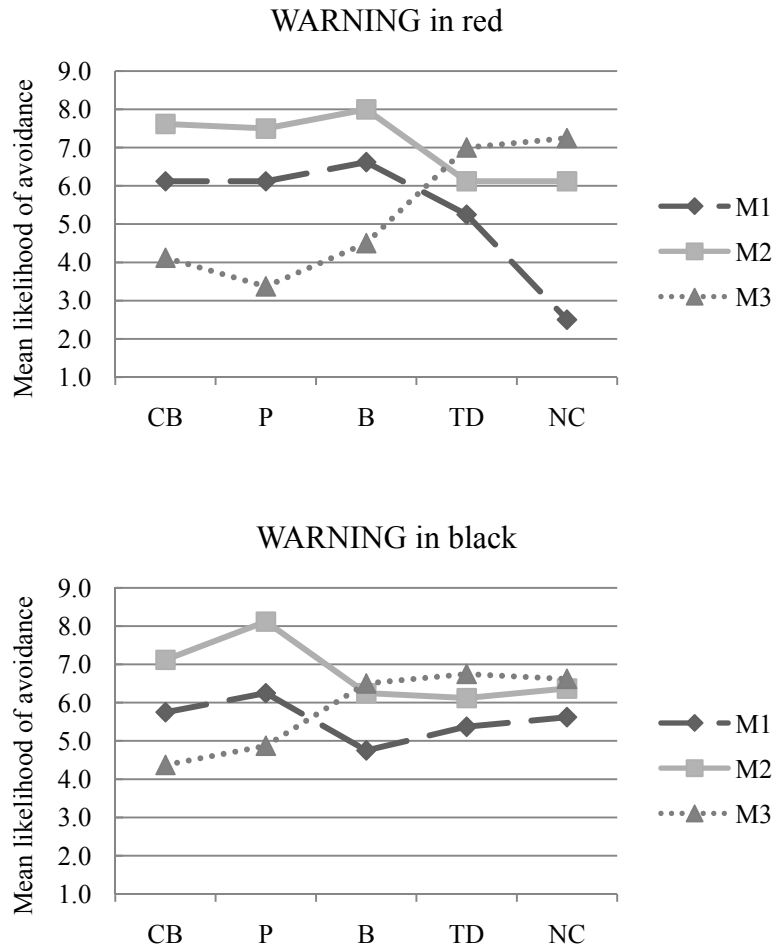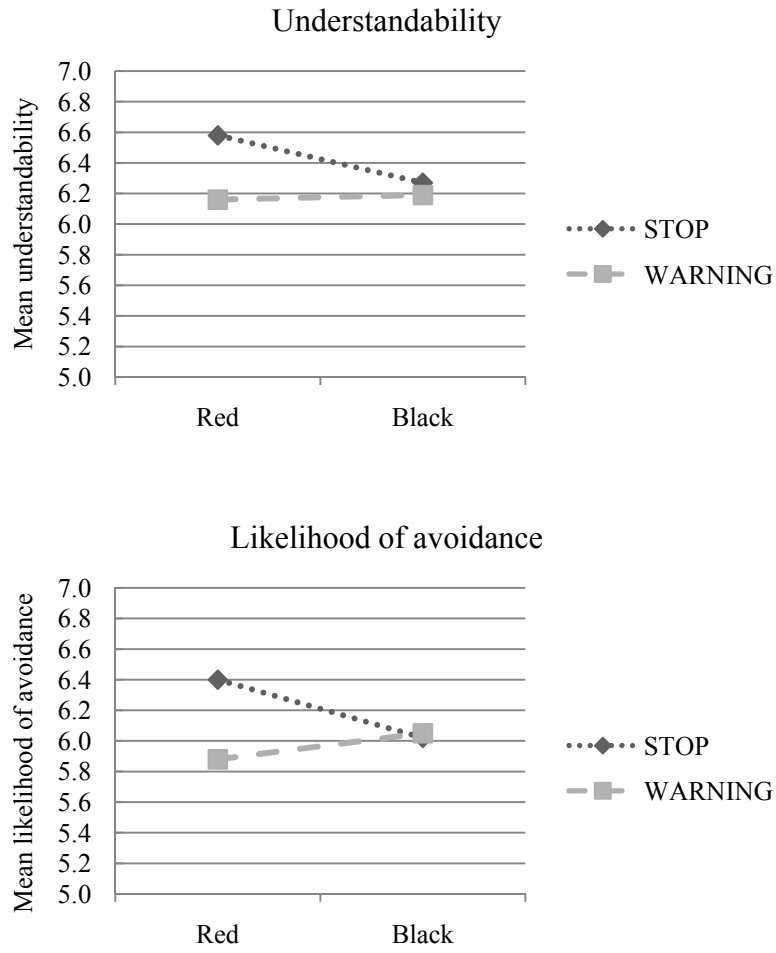
Figure 36. Color x signal word interaction (children).

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