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The Influence of Negative Information on Trust in Virtual Teams

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by

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Abstract

Organizational work is characterized by positive as well as often negative work behaviors from employees. The same may be said of work done in virtual teams, where computer-mediated communication among team members can be particularly uncivil and inflammatory (Wilson, Straus, & McEvily, 2006). Accordingly, trust has been theorized as more difficult to develop in these types of teams compared to traditional face to face teams. Using a computer simulation of a collaborative team task, this study examined how individuals in virtual teams integrate conflicting pieces of positive and negative information about a teammate into one overall rating of trust. Data were analyzed from 240 individuals to examine the influence of these behaviors on levels of trust toward a target teammate. Evidence of trust quickly developing and declining, i.e., the dynamic nature of trust, in a virtual team was observed. Secondly, the negativity effect was found, where a negative behavior was given more weight in ratings of trust than a positive behavior. Next, the hierarchically restrictive schema was offered as a plausible explanation for the negativity effect due to creating asymmetrical expectations of subsequent behavior based on an initially observed behavior. Lastly, a significant negativity effect was not found when the two behaviors were performed, one each, by a pair of unrelated persons or by a pair of related persons with entitativity.

Chapter 1: Introduction

This research aims to address three issues that individuals in work teams are commonly faced with. The first deals with uncovering how conflicting positive and negative trust information are weighted by an individual to influence their level of trust toward a target teammate. The second aim is to examine how initial trust or distrust toward a target influences expectations of behavior and subsequent levels of trust. The third objective is to investigate how information weighting and expectations of behavior vary when the behaviors stem from multiple sources, specifically, a pair of related or unrelated individuals.

Trust

Trust, which is broadly conceptualized as confidence in another person, is omnipresent and central to many types of relationships whether they are personal, professional, political, or economic. There is a general consensus that social interaction relies on trust as a lubricating mechanism for frictionless contact between two entities (McAllister, 1995; Wildman, 2012; Mayer et al., 1995). Scholars from a range of disciplines have acknowledged the importance of trust and the positive properties associated with it (Mayer et al., 1995; Webber, 2008; Dirks & Ferrin, 2001).

Trust in Organizations

Trust can have positive effects on individuals and teams. See Dirks and Ferrin (2001) for a list of empirical studies; for instance, they report that trust has a positive relationship with accuracy of information sent to others (Roberts & O'Reilly, 1974) and group performance (Dirks, 1999), as well as a negative relationship with conflict (De Dreu et al, 1998). Mounting

research evidence also suggests that trust is a key ingredient to successful organizational functioning (see Kramer, 1999, for a narrative review), exhibiting links to a number of work outcomes, in particular: performance (Rich, 1997), organizational citizenship behavior (McAllister, 1995; Robinson 1996), organizational commitment (Costa, 2003) and satisfaction (Costa, 2003; Rich 1997; Ward 1997). Furthermore, trust facilitates communication (Smith & Barclay, 1997) and cooperative behaviors (McAllister, 1995), thereby enabling a range of organizational operations from leadership, negotiation, and performance appraisal (Fulk et al., 1985) to selling alliances (Smith & Barclay, 1997) .

Overall, the topic of trust has received considerable attention among organizational researchers, with the majority of studies converging on the conclusion that trust is requisite for workplace functioning. This is logical given the interpersonal nature of organizational work and the large extent of which is accomplished depending on the quality of relationships held among leaders, followers, and peers (Kramer, 1999). Many work relationships and business partnerships are becoming virtual; organizations are progressively turning to the use of virtual work teams to sustain an advantage in an increasingly collaborative and technological world. These all drive the impetus for additional trust research.

Trust in Teams

Current times necessitate a workforce of individuals who can collaborate efficiently in teams to meet fast-paced and complex workplace demands. Trust has been identified as a crucial component of teamwork by Salas, Sims, and Burke (2005) who assert that five essential elements of teamwork: leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation; require the supporting mechanisms of mutual trust and communication in order to be effective processes. This suggests that the influence of trust on work outcomes may not

always be produced in a direct manner. It is plausible that proximal determinants of work outcomes are moderated by levels of trust; for example, motivation to achieve a goal depends on the amount of trust one has in his or her teammate (Dirks & Ferrin, 2001). Moreover, trust is influential on outcomes through mediating factors such as openness in communication, information sharing, and need-based monitoring (DeJong & Elfring, 2010). Research repeatedly demonstrates that teams consisting of members who hold trust for each other have more open communication (Smith & Barclay, 1997) and share more information (O'Reilly, 1978), both of which contribute to a shared understanding within the team and better team outcomes.

The absence of trust among team members, on the other hand, can be detrimental. It can raise negative interpretations of each other's monitoring behavior (Salas, Sims, Burke, 2005) and produce a climate of discord which exhibits a negative relationship with performance (Porter & Lilly, 1996). Members of a low trust team deplete time and resources on monitoring, duplicating work, and engaging in defensive behavior. These costly expenditures can translate to process loss and decreased team effectiveness (Wilson, Straus, McEvily, 2006 citing Ashforth & Lee, 1990; McAllister, 1995).

Distrust

Despite the emphasis on high trust and its associated positives for the workplace, trust is not guaranteed between people. In many cases distrust can occur (Kramer, 1999), and researchers have begun to explore this issue in organizations. Hansson, Jones, and Fletcher (1990) discovered that almost a fifth of their study participants reported experiencing betrayal by a coworker and remembered these incidents decades after their occurrence. Betrayal need not be an extreme or grave act. It has been noted that everyday incidents can violate trust, such as forgetting to return a borrowed item or a promised phone call. Broken promises, unmet

expectations, and other behaviors, such as lying, stealing, disclosing secrets and jeopardizing another's reputation have all been identified as violations of trust (Elangovan & Shapiro, 1998).

Conceptually, many of these negative behaviors fall under the constructs of workplace deviance and counter-productive work behavior. Workplace deviance is a class of behaviors that are intentional and violate organizational norms; they threaten the functioning of an organization and include sabotage, blackmail, lying, theft, sexual harassment, and contract violations (Elangovan & Shapiro, 1998 citing Robinson & Bennett, 1995). Two other common examples of workplace deviance that are especially pertinent to teams are withholding critical information and sharing inaccurate information (e.g., lying, Kim, Ferrin, Cooper, Dirks, 2004). Counter-productive work behaviors (CWB) are similarly defined as, "volitional acts intended to harm an organization or people in the organization." However, they do not necessarily violate organizational norms (Spector et al., 2006). Both these constructs have received extensive research attention given the magnitude of impact they can have on workers and organizations. Inadvertent behaviors, such as unintended poor performance or events that occur outside of one's immediate control, are excluded from definitions of deviance and CWB, but also commonly occur in the workplace and can lead to violations of trust. Particularly with regard to virtual teams, studies have found that the computer-mediated communication in such teams is characterized by more inflammatory language and uncivil behavior. These low quality interactions are likely to further contribute to relationship conflict (Siegel et al., 1986; Wilson, Straus, & McEvily, 2006).

Building on the work of social psychology and trust researchers, the present study examines how individual trust within work teams is changed by the valence of information received about a target. When teams are first formed, how do individual members form

impressions of their teammate's trustworthiness? How do members integrate conflicting pieces of information about a teammate to make a trust judgment? These are some of the questions I seek to *examine.*

Trust in Temporary and Virtual Teams

The definition of a team is "a set of two or more individuals who have specified roles interacting adaptively, interdependently, and dynamically toward a common and valued goal…and who have a limited life span of membership" (Salas, Sims, & Burke, 2005, p.559-562). Essentially, a team is comprised of individuals with relationships of lateral interdependence. Members depend on each other to achieve joint goals, and this level of interdependency is reliant on trust development (Dirks & Ferrin, 2001).

Costa, Roe, and Tallieu (2001) observed that over the years, workplaces have become less vertically structured and more horizontally oriented around groups of individuals. Today's fast paced world of work not only demands the use of work teams but also demands that organizations use the flexibility and adaptability offered by *temporary* work teams. These types of teams are comprised of individuals who assemble to accomplish complex tasks without prior experience of working together and are not expected to continue working as a team (Jarvenpaa & Leidner, 1999). Immediately after their formation, temporary teams are required to work in unison although the members do not share a past history of working together (Wildman, 2012, p3; Jarvenpaa & Leidner, 1999). Examples of such teams are plentiful, including: military combat units, aircraft flight crews, surgical teams, disaster response teams, SWAT teams, firefighting teams, emergency room medicine teams, film crews, and task forces; such teams are also referred to as 'swift-starting-action-teams' (Wildman, 2012, p3). From these examples, it is evident that many temporary teams operate in high stakes, life or death situations wherein trust,

cooperation, and communication are all crucial to accomplishing team goals. However, given the rapid nature of these teams' assembly, it is unclear whether there is enough time for a high level of trust to develop.

Teams can place on a continuum based on their degree of virtuality. Teams that are exclusively reliant on technology-mediated communication are classified as virtual teams, while teams that can communicate face-to-face are regarded as traditional face-to-face teams (Kirkman & Mathieu, 2005). In addition to communicating electronically, virtual teams are commonly geographically or temporally dispersed (i.e., distributed, Jarvenpaa & Leidner, 1999). Some research suggests that virtual team processes differ from those of face-to-face teams; for instance, members of virtual teams possess lower attitudes about cohesiveness, getting along, or staying intact as a team (MacDonnell, O'Neill, Kline, & Hambley, 2009). Furthermore, trust is theorized to be particularly challenging to develop in virtual or distributed teams whose members are not co-located. Differences in team processes can imply different trust development between the two types of teams, emphasizing the importance of exploring trust development within the virtual team context.

Both temporary and virtual teams offer several advantages over traditional geographically-bound teams and are increasingly being used in organizations (Kuo & Yu, 2009). Some of these advantages are as follows. First, virtual teams allow projects to be carried out continuously, much like a relay where team members in one time zone continue the workflow while members in another time zone rest and vice versa. Coupled with cut costs from the elimination of commuting, these types of teams support the organizations' goal of efficiency (DeRosa, Hantula, Kock, & D'Arcy, 2004). Second, virtual teams permit organizations to reach higher potential by enabling them to recruit experts from distal regions of the world, as well as

foster more cultural diversity in an organization's workforce. With the upsurge of virtual teams, the role of trust in team performance takes on greater importance.

Trust Theories

Trust has been studied in various domains and disciplines using various measures. As a result, a variety of conceptualizations and components of trust have been purported. Upon review, there appears to be some convergence. Specifically, trust involves a confident expectation of behavior and a willingness to put a level of vulnerability or risk in the other party (Bigley & Pearce, 1998; Rousseau et al., 1998).

Trust has been identified as one of the three key factors influencing virtual team process (Costa, Roe, & Taillieu, 2001). Yet, there is agreement that trust is difficult to develop in virtual teams. This is fueled in part by research, as alluded to earlier, showing that initial communication is different in virtual teams; for example, more inflammatory remarks (Wilson, Straus & McEvily, 2006), and more impersonal task-based communication (Hart & McLeod, 2003). Although mixed findings in this area have emerged and may be due to differences in measurement timing and team duration (Wilson, Straus, McEvily), some scholars, such as Handy (1995), have gone further to argue that 'trust needs touch' and that the computer mediated environment of virtual teams precludes the necessary face-to-face interaction required for trust.

Several explanations have been proposed for the idea that trust is inferior in virtual compared to face-to-face teams. The first supposition revolves around the richness of cues transmitted among team members (see media richness theory, Daft & Lengel, 1986; and social presence theory (Short, Williams, & Christie, 1976). Co-located members can receive more information about each other (i.e., their interactions are richer, more personal, involve a higher number of cues and channels) and can subsequently develop bonds or a collective identity more

easily. Repeated interactions, such as observing and talking with one another, generate trust as people become more understandable and predictable. Team members in virtual or distributed teams cannot observe each other as easily. Their lack of physical interaction results in fewer social cues and more difficult communication (DeRosa, Hantula, Kock, D'Arcy, 2004). As such, trust is argued as easier to establish among members who are working face-to-face. Prisoner-dilemma games offer one example of how more trust occurs between people who are in close proximity to each other because visible social cues, such as facial expressions, can reveal whether the target is going to cooperate (Wilson, Straus, McEvily, 2006). By contrast, the social cues and non-verbal information in computer mediated communication are dampened. Nonetheless, these theories do not consider the familiarity and bonds that can be created among team members over time that contribute to the development of trust. DeRosa et al. (2004) also suggest that other characteristics may be informative to impression formation and subsequent trust if visible surface level cues are not available; for instance, task performance and technological competence.

Other explanations for the inferiority of trust in virtual teams are tied to the inherent definitional characteristics of virtual teams. For example, the lack of past association and the diversity of backgrounds possessed by geographically dispersed team members may result in slower formation and growth of trust. Moreover, members of virtual teams have fewer opportunities for bonding, socializing, and building rapport outside of the task given their physical distance. Diminished interaction can hamper the development of interpersonal relationships as well as the emergence of affective trust (Webber, 2008). The hindrance of reduced communication and lack of informal interaction on trust development is the major implication of the Time Interaction and Performance Theory (TIP, McGrath, 1991). According

to TIP theory, teams depend on the relational linkages among its members to progress through stages of activity, and these links are especially important in newly formed teams with no past association. As aforementioned, the electronic-only communication medium used by virtual teams limits opportunities for informal communication and social interaction, and as a result the development of relational links is attenuated in virtual teams (Jarvenpaa & Leidner, 1999; Warkentin et al., 1997). Resultantly, trust is theorized to be lower in virtual teams than in teams interacting face-to-face. Furthermore, virtual teams must spend more time on developing these relational links than on completing their tasks. It is possible that time is the necessary ingredient for sufficient interpersonal interaction allowing for trust to evolve in virtual teams.

Social Information Processing Theory (SIP, Walther, 1992) argues firstly that interpersonal interaction is not inferior when the communication medium is virtual and that it can reach the same level as in face-to-face to teams. Secondly, SIP theory implies that it merely takes more time for virtual teams to develop relationships and trust but eventually will reach the same levels as they do in traditional teams. In other words, team members will adapt to the virtual communication medium and trust will be similarly achieved, albeit with extended time (Jarvenpaa & Leidner, 1999). Based on SIP theory, neither physical presence nor face-to-face communication makes a difference in whether or not trust develops or in how much trust develops. The key factor in team relational development appears to be time. Wilson, Straus, and McEvily (2006) found support for the idea that trust can reach the same levels in distributed as in co-located teams but develops at a slower pace. When measured at the first time point, trust is lower in virtual teams. Yet with subsequent measurements, levels of trust are found to be comparable in both types of teams. This finding makes sense given that members of virtual teams require more time to exchange social information, in part due to the lack of easily

perceptible cues (e.g., instant response and feedback from people in terms of tone, non-verbal facial cues, gestures, and the number of perception channels utilized). This research suggests that trust can indeed form in virtual teams and that virtuality (or communication medium) may be a factor influencing the *speed* of trust development in teams but not necessarily a factor leading to different *levels* of trust in teams.

Trust Construct

Research on trust has generally taken one of two directions, behavioral or psychological. Trust examined in the behavioral tradition is typically observed in simulated lab interactions as a rational decision about how much to cooperate or compete with another person, or as a rational expectation of some event emanating from another person. Accordingly, high trust in this approach is operationalized as cooperative behavior, e.g., "if I trust you, I will cooperate with you," and low trust is indicated by competitive behavior (Lewicki, Tomlinson & Gillespie, 2006 citing Deutsch, 1958 and Axelrod, 1984). Changes in the frequency and extent of cooperation are inferred by researchers as manifestations of changes in the underlying level of trust the individual has for the target. It is possible, however, that cooperation may be due to factors unassociated with trust (e.g., coercion), making those inferences about underlying trust less accurate (Rousseau, Sitkin, Burt, & Camerer, 1998). Cooperative and competitive behaviors are typically recognized by the observer as indicators of the actor's trustworthiness, in turn influencing their own levels of trust toward the actor (Lewicki, Tomlinson & Gillespie, 2006). In line with this, psychology research has revealed that the majority of variance in trust is accounted for by both trustworthiness perceptions and cooperative behaviors from the target (Costa, Roe, & Taillieu, 2001).

The psychological approach does not assume rational thinking is the sole driver of actions. Instead, the psychological approach focuses on understanding the internal cognitive and affective processes that determine behaviors, and trust is conceptualized as a "cognitive expectation or affective sentiment" (Smith & Barclay, 1997; Lewicki, Tomlinson & Gillespie, 2006). The unidimensional view describes trust as lying on the opposite pole of the same continuum as distrust (Lewicki, Tomlinson & Gillespie, 2006), and models under this approach suggest that trust is captured by multiple components, namely, the affect and cognition components of trust (McAllister, 1995; Jones & George, 1998). Some scholars contend that interpersonal trust is related to confidence in the other person, i.e., the "extent to which a person is confident in and willing to act on the basis of words, actions, and decisions of another" (McAllister, 1995). Some incorporate the idea of willingness to be vulnerable into the definition of trust (Mayer et al., 1995; Bigley & Pearce, 1998; Rousseau et al., 1998). Others define trust in terms of predictability or optimistic expectations about others (Elangovan & Shapiro, 1998; Lewicki & Bunker, 1996). Costa, Roe, and Tailleu (2001) include behavior as a component of trust and offer the following definition, "a psychological state that manifests itself in the behaviors towards others, is based on the expectations made upon behaviors of these others, and on the perceived motives and intentions in situations entailing risk for the relationship with those others" (page. 228). In sum, as reviews by Rousseau et al. (1998) and Bigley & Pearce (1998) have noted, the central themes across the various definitions of trust are vulnerability and positive expectations.

In Mayer et al.'s (1995) integrated model of trust, trust is proposed to be a direct function of perceived trustworthiness which is comprised of three characteristics: ability, integrity, and benevolence. Perceived trustworthiness and trust are represented cyclically, where

trustworthiness is a proximal determinant of trust, and trust is depicted as an outcome of trusting behavior that then feeds back into the factors that determine trustworthiness, i.e., ability, benevolence, and integrity. This model offers a description of how trust is dynamic (Lewicki, Tomlinson, & Gillespie, 2006). Colquitt, Scott, & LePine's (2004) meta-analysis also reveals that perceived trustworthiness (specifically: ability, benevolence, and integrity) exhibit robust relationships with trust. From the observer's point of view, ability refers to the target's knowledge and competence; integrity denotes perceived character and motives based on the reliability of the person's past actions; while benevolence is the belief that the target wants to do good and is acting in the interest of the team (Mayer et al., 1995). Unfortunately, virtual and temporary teams are not afforded with adequate time to perceive covert trustworthiness characteristics and must rely on overt pieces of information from which to infer trust (Wildman, 2012 citing Meyerson et al., 1996).

In sum, although there are various proposed definitions of trust due to the range of domains in which it has been studied, there does appear to be some convergence on its fundamental conceptualization. The majority of scholars appear to agree that interpersonal trust consists of one's perceptions, based on observed behavior, about the extent to which a target holds concern for their team coupled with the extent to which the target holds the necessary knowledge and ability to perform one's functions within the team.

Components of Trust

McAllister's (1995) two factor model of cognitive and affective based trust is widely recognized and has received compelling factor analytic and empirical support. Trust decomposed into cognitive and affective components is also in line with the influence of trustworthiness (composed of ability, integrity, and benevolence) to the establishment of trust.

Cognitive based trust is proposed to arise from knowledge about the trustee's level of ability, skill, knowledge, or competence. Additionally, the term may stem from the observer's cognitive processing of information to form an initial judgment of the person's trustworthiness and the observer's decision to trust or not to trust the person (Lewicki, Tomlinson, Gillespie, 2006). Of note is how members of virtual teams have no history working together, and thus are likely to encounter difficulty assessing ability and competence at the outset. Cognitive trust, or beliefs about a target's competence at the outset may instead be influenced by what McKnight et al. (1998) label as cognitive "categorization processes." These rely on assigning trustworthiness or competency attributions that are based on reputation and second hand information (McKnight, Cummings, & Chervany, 1998). Other people's opinions of the target's dependability can influence one's own evaluation of the target (McAllister, 1995).

After working together for some time, emotional bonds form among team members and relationships evolve to include an element of affective trust. An affective sentiment that the target holds genuine care and concern for the welfare of other members of the team stimulates affective-based trust to develop (McAllister, 1995). Although the two components are correlated, empirical research has evinced the distinction between cognitive-based trust and affective-based trust (McAllister, 1995; Johnson-George and Swap, 1982).

Affective-based trust is developed through frequency of interaction and citizenship behaviors, such as doing extra things for team members, willingly helping each other, and taking a personal interest in the team. The more affect-based trust one has for a peer, the more citizenship behavior they are likely to direct toward that peer. Citizenship behavior is correlated with the affective component, but it is not significantly related to cognitive trust (Webber, 2008). Furthermore, affect-based trust is positively correlated with attending to the needs of a peer,

referred to as '*need based* monitoring' (McAllister, 1995). This construct by definition parallels both citizenship behaviors and backup behaviors, which encompass offering feedback, resources, and assistance on a task to a teammate (Porter et al., 2003).

Monitoring behavior that is not need-based but instead motivated by a lack of trust, i.e., tracking each other's work and creating backup plans, is negatively correlated with cognitive trust but unrelated to affective trust (Webber, 2008, p.16). Cognitive-based trust is thought to be predicted by early trust and reliable performance. Interestingly, however, results from both McAllister (1995) and Webber (2008) do not demonstrate support for this relationship. Webber (2008) found that neither prior trust nor performance influences trust on its own, but they do interact to impact trust. Specifically, in order for reliable performance to have an effect, early trust must be present. McAllister (1995) recommends that more research be conducted on the antecedents of cognitive trust. Moreover, fundamental questions remain regarding how ineffectiveness and other performance mishaps can affect trust in teams.

Dynamic Trust

As research on trust has progressed, the realization has surfaced that trust is a dynamic construct. Trust develops and declines in response to the interactions of the team and is best measured over multiple points in time (Webber, 2008; Lewicki, Tomlinson & Gillespie, 2006; McGrath, 1993; Wilson, Straus, McEvily, 2006).

Initial encounters are purportedly characterized by a baseline point of zero trust, and through repeated interactions trust is theorized to change (Jones & George, 1998). In another view, individuals start at a positive level of trust, demonstrating the presumption of trustworthiness, i.e., trustworthy until shown evidence of the contrary (McKnight et al., 1998). This is plausible because team members indeed were selected for the job, providing some level

of credibility and setting the foundation for initial positive trust. It is also possible for individuals to possess an initial level of distrust due to negative trust information obtained from the target's reputation. This is especially relevant in the absence of first hand past experience with the individual, which is the common case for virtual and temporary teams (Lewicki, Tomlinson, & Gillespie, 2006).

As Jarvenpaa & Leidner (1999) note, trust in virtual teams is likely established based on the first few messages communicated. Initial judgments about the target are followed by subsequent calibrations creating changes in trust levels over time. Trust levels fluctuate depending on trust behaviors exhibited by the target that are either congruent with expectations (increase in trust) or trust violations (decrease in trust) (Lewicki, Tomlinson, & Gillespie, 2006). One violation could result in a sharp decline in levels of trust.

Some scholars extend the idea of malleable trust by further positing that there are different stages or forms of trust that evolve over time (Lewicki, Tomlinson, & Gillespie, 2006; Rousseau et al., 1998). They propose the first to form is calculus-based trust, which is centered on a rational analysis of the perceived costs to benefits associated with maintaining the relationship. For example, what are the costs and benefits to staying in the relationship relative to those incurred from violating or breaking the relationship? The second form of trust to emerge is knowledge-based trust which is derived from the belief that the target is competent in their role. Knowledge-based trust also stems from having familiarity with the target, enough to predict the target's behavior, thereby reducing apprehension about how they will act in any particular situation. After several performance episodes and interactions, team members feel a sense of identity with the group and develop the third form, identity-based trust (Lewicki, Tomlinson, & Gillespie, 2006). Some factor analytic support exists for these three components (Lewicki,

Tomlinson, & Gillepie, 2006 citing Lewicki & Stevenson, 1998); although, researchers have noted that identity based trust is analogous to affective-based trust since both arise from repeated interactions that foster care, concern, and emotional attachment (Lewicki, Tomlinson & Gillespie, 2006), and McAllister's (1995) two component structure of cognitive and affective trust has received the most empirical support.

One may pose the question: do the stages of trust differ in virtual teams? The trust development theories discussed so far draw attention to the inferiority of the virtual or temporary team environment for developing trust (e.g., media cue richness, less interaction, TIP theory, SIP theory). Yet previous experimental work seems to suggest that trust can develop quickly in virtual teams and change over just a short duration of time.

Henttonen and Blomqvist (2005) performed a case study of a global virtual team. Their study revealed that the factors crucial for building trust in a virtual team are fundamentally the same as the factors important for face-to-face teams; namely: open communication, cooperation, reputation, professional competence, care, and concern for teammates. *Swift trust* has been cited in the literature involving temporary or virtual teams (Wildman, 2012; Jarvenpaa & Leidner, 1999).

Wildman (2012) proposes that imported information is used to create swift trust in temporary teams through schemas – cognitive structures inherent to people for the purpose of organizing related knowledge and concepts about the world. Information received about the target from another source is incorporated into the present relationship upon a first encounter. The imported information is compared to existing schemas to influence an ensuing trust attribution. That is, in the absence of a shared work history, characteristic of temporary teams, swift trust can be created based on stereotypes (e.g., all business people are untrustworthy) or

implicit theories. This allows teams to quickly convene and accomplish complex goals such as emergency medicine or disaster rescue. Many of these quick judgments may be heavily influenced by anger and gratitude emotions (Wildman, 2012). Indeed, the idea of affect as information (Schwarz & Clore, 1988) has received empirical support where people erroneously use the valence of their feelings to inform their judgment (Dunn & Schweitzer, 2005). Once team members have worked together, subsequent perceptions of trustworthiness from deep level cues become influential. Team process behaviors (e.g., monitoring and coordination) that occur in a performance episode yield clues about the character of team members, specifically their ability, integrity, and benevolence. At the culmination of a performance episode, post-task reflection informs trust changes (Wildman, 2012).

The formation of swift trust in virtual teams is presumably based on first impressions formed from an initial communication behavior (Jarvenpaa & Leidner, 1999). This first impression is crucial because in the case of initial low trust, it may be difficult to transition to high trust. Through communication behaviors, swift trust in virtual teams can quickly form despite its members not being afforded with the time to infer judgments of competence or trustworthiness.

Cognitive and affective based trust have been observed in real world temporary and virtual teams. However, these two components are typically not observed in lab experiments using short term teams. Research demonstrates that affective-based trust emerges after cognitive-based trust (Webber, 2008). Thus it is plausible that the multidimensionality of trust is obscured by a temporal factor in studies examining short term teams. In other words, the results where multiple components of trust have not been found may be artifactual from the snapshot nature of the research (Webber, 2008). Additionally, the moderate correlation between the two factors

might complicate the distinction between the two types of trust in such a short time frame (Webber, 2008).

Results from Wilson, Straus, and McEvily (2006) run counter to the idea that cognitive trust is necessary for affective based trust to develop in the relationship. Instead, their results suggest that the two factors of trust are present within the first week of working together and seem to develop in tandem -- even across teams using different communication media. These authors argue that their results are consistent with theoretical arguments about affect or emotions having an underlying influence on trust throughout the span of the relationship, rather than affective and cognitive trust developing in separate stages (Williams, 2001). McAllister's (1995) cross sectional study also found that the two factor structure (cognitive and affective) of trust fit the data well.

In sum, the literature demonstrates that trust overall is influenced by a variety of factors, including communication, imported information, trustworthiness perceptions, information sharing, citizenship and monitoring behaviors (see Mayer et al., 1995 for a table of trust antecedents). Unmet expectations about a teammate's task reliability can erode trust, particularly when they are attributed to the fault of the person and believed to happen again (Sitkin & Roth, 1993). Teams deprived of trust are likely to experience coordination difficulties (Webber, 2008), waste time on ineffective behaviors, as well as suffer from low satisfaction and sustainability beliefs regarding the team (Wilson, Straus, & McEvily, 2006).

Purpose

This research strives to enrich our understanding of how negative trust information from a teammate influences an individual's impression of that teammate. Many researchers have

investigated how trust forms in teams. This study by comparison also investigates how trust declines as people are faced with negative and contradictory information about their teammates.

Interactions among teammates are not invariably positive. Just consider the extent of research attention workplace deviance and counterproductive work behaviors (CWB) have received. Miscommunication, task errors, and poor individual performance each are examples of negative behavior in work teams that may influence trust levels. Given that members of a work team typically engage in a combination of positive and negative behaviors, how does an observer integrate these opposing pieces of information into an impression of trustworthiness and an overall judgment of trust? How do initial trust judgments influence expectations of subsequent behavior and trust levels? Does the phenomenon change when the conflicting behaviors come from an aggregate pair of unrelated individuals or from a meaningful pair of related individuals? This study seeks to investigate the influence of negative trust information on trust over time in a virtual team and to provide insight to these above questions. I now move to impression formation as it provides a theoretical backdrop to this research.

Impression Formation

An observer's impression of a teammate's trustworthiness is likely to bear on how much he or she will trust the teammate. The process of impression formation has been extensively covered in social psychology. Work in this area has investigated impressions of dispositional dimensions such as immorality-morality (Coovert & Reeder, 1990; Skowronski & Carlston, 1987). This study will seek to extend the impression formation literature by examining the dimension of untrustworthiness-trustworthiness in the context of virtual work teams.

Implicit personality theory (Schneider, 1973) suggests that individuals combine pieces of information to form impressions. The structure of how behaviors and traits are related is further

specified by schemas posited by Reeder & Brewer (1979). In general, impression formation begins with receiving information about a source (salient information from behaviors, surface level cues, or second-hand information transmitted from a third party, such as rumor or reputation). This information is then taken and interpreted through a comparison process to preexisting knowledge that is organized as mental schemas, i.e., sets of assumptions and expectations relating behaviors to dispositions (Wildman, 2012; Reeder & Brewer, 1979).

In more specificity, Reeder & Brewer (1979) describe the impression formation process through proposing the schematic model of person perception. Under this model, impression formation begins with behavior classification, where the observer classifies the actor's behavior on a specific attribute dimension, such as, "this is a trust-related behavior." Once this behavior dimension has been identified, its location or extremity is judged according to the observer's belief about how frequently occurring this behavior is in the population in general. The higher frequency with which the behavior occurs, the less extreme the behavior is judged to be. Individual differences relating to the observer's personal experiences and expectations can play a role, such that the classification of a behavior along an attribute continuum may vary between individuals or even over time within individuals (Reeder & Brewer, 1979).

Following behavior classification, dispositional inference or the process of determining the actor's position on the *disposition* continuum begins. Dispositional inference relies on 'implicational schema' or pre-existing assumptions and expectations about what behaviors occur at a given dispositional level (Reeder & Brewer, 1979). In other words, observers hold implicit theories about the relationships between behaviors and dispositions and use these implicit theories to make judgments about a person's disposition based on their behavior. These implicit

theories can be so strong that "particular behaviors lead directly to trait attributions" and are typically made without much deliberate cognitive processing (Trafimow, 1994).

Several schematic networks for how people infer disposition from behavior have been put forth. These include the partially restrictive schema, hierarchically restrictive schema, and the fully restrictive schema. The partially restrictive schema is symmetrical because dispositions at both the upper extreme and lower extreme are expected to exhibit a range of behaviors. Consider the friendliness trait as an example. A friendly person can occasionally perform unfriendly acts, depending on context, to the same degree that an unfriendly person can sometimes act in a friendly way. An inconsistent behavior does not overturn an attribution of that trait (Trafimow, 1994). This study's trait dimension of interest is untrustworthiness-trustworthiness. For reasons discussed below, it appears reasonable to presume that the hierarchically restrictive schema is most applicable to attributions of trust.

Hierarchically Restrictive Schema

The hierarchically restrictive schema assumes that people possess a certain stable level of a trait. Furthermore, dispositions at the upper extreme of the trait continuum (e.g., untrustworthy) are not behaviorally restricted while dispositions at the lower extreme (e.g., trustworthy) are behaviorally bound. The poles of a trait continuum are asymmetrical: a range of behaviors is expected from those at the upper pole while only consistent behaviors are expected at the restricted pole (Trafimow, 1994). Figure 1 visually depicts the implicit links between behaviors to dispositions under the hierarchically restrictive model. Generalizing the social psychology research on honesty and morality to the trait of trust, it should follow that a person who is seen engaging in a positive trust behavior (B_0 in Figure 1) can be attributed to either a trustworthy (D_0) or untrustworthy (D_2) disposition, as evidenced by two arrows. In contrast, a negative trust

behavior (B_2) can only come from an untrustworthy (D_2) disposition, as evidence by the single arrow to B_2 from D_2; see Figure 1. This asymmetrical pattern of beliefs has been found with the following traits: intelligence, morality, and honesty (Trafimow et al., 2005), but has not yet been shown for trust.

In the case of ability, individuals at the upper end of the continuum have a broader range of behavioral possibilities because they can perform at the extremes, either outstanding or terrible. In contrast, individuals with low ability are limited to performing poorly (Trafimow, 1994). A negative disposition (i.e., low ability) is more behaviorally restricted. Thus, an instance of positive behavior is more informative and given more weight because only an individual with high ability can perform such a behavior (Skowronski & Carlston, 1987). Consequently, it seems that when the trait is ability related, the behaviorally unrestricted upper pole is a positive disposition. In contrast, when the trait is morality related, the upper extreme pole is a negative disposition (e.g., highly immoral person can exhibit a range of behaviors) (Skowronski & Carlston, 1987; Trafimow, 2001).

The hierarchically restrictive schema also implies that negative behaviors can be more diagnostic of morality based traits. It appears that just one negative behavior can be enough for the observer to judge the target as possessing a negative disposition, but when the behavior is positive, a single display is not diagnostic of any specific disposition level. Confidently attributing a trustworthy (lower extreme) disposition to somebody will require multiple observations of only positive behavior. This is because a positive trust behavior could theoretically come from any disposition across the continuum, ranging from highly untrustworthy to moderately and trustworthy dispositions (Reeder & Brewer, 1979).

Weighting Information

When observers are presented with multiple behaviors from an entity, there is considerable support for the notion that rather than simply averaging the behaviors in a piecemeal way, the observer will give the negative information more weight in the impression (Fiske 1980; Ostrom & Davis, 1979). Researchers initially sought to verify the averaging approach in the formation of impressions (e.g., Anderson, 1965). However, the obtained results ran contrary to their initial theorizing. There is now ample research supporting the theory that negative information has more weight on impressions (Baumeister et al., 2001). A close examination by Hodges (1974) reveals that a simple averaging model is predictive of impressions only when both pieces of information are positive. Furthermore, when both pieces of information are negative, the impression formed is more negative than what is expected with simple averaging. Lastly, when there is one piece of positive information and one piece of negative information the negative information is more influential. As Baumeister et al. (2001) point out, this means that discovering something negative about an acquaintance is more impactful than learning something positive about the person. More research on interpersonal relationships, i.e., marital research has demonstrated that the avoidance of doing something bad is more important to the quality of the relationship than actively doing something good (Baumeister et al., 2001 citing Gottman, 1979). Another exception to the negativity effect may be when the pieces of information emanate from two unrelated sources. Coovert & Reeder (1990) found support for this with a lab experiment on morality.

Negativity Effect

Social psychology studies abound have shown the greater weight of negative information, leading to the term ‘negativity effect’ (Reeder & Brewer, 1979; Skownronski & Carlston, 1989), also known as ‘positive negative asymmetry’ (Baumeister et al., 2001).

Most empirical findings corroborate the negativity effect, demonstrating that the stronger influence of the negative is robust across a variety of psychological phenomena. Baumeister's (2001) qualitative review of findings from a diverse range of psychological research did not find any area of research where there is a consistent finding against the negativity effect. It appears that possibly the only exceptions to the negativity effect are when the trait is ability, when both behaviors are positive, and when the conflicting behaviors emanate from unrelated sources in impression formation.

A review of the research reveals that people direct more attention and cognitive processing to the bad than the good. For instance, Fiske (1980) found that people tend to take more time to process negative information when asked to form an impression. In line with this, Skowronski & Carlston (1987) found that bad behaviors are recalled more, in which recall is likely linked to more cognitive processing having taken place.

Reeder & Coovert's (1986) study examined the process of revising impressions. They found that inconsistent behaviors influenced individuals' judgments of the target in an asymmetrical fashion. When the target person was initially judged as immoral and subsequently performed a moral action, subjects did not change their impression of the target as much as when the target person was initially judged as moral and subsequently performed an immoral behavior. This demonstrates the negativity effect and suggests that a moral behavior is unlikely to counteract an initial immoral judgment. It is also a manifestation of the hierarchically restrictive schema where immoral dispositions are less behaviorally restricted, so a person judged as immoral is expected to perform a range of behaviors, and thus, the initial impression remains unaltered. In contrast, an immoral (or negative) behavior does have the power to change an initial moral judgment (since a negative behavior must come from a negative disposition, and

thus the impression is revised). Reeder and Coovert (1986) additionally found that the time it takes to revise an initial moral impression when presented with a subsequent immoral action from the target is significantly longer than when an initial immoral judgment is followed by a subsequent moral action. This is presumed because the immoral action violates expectations more and requires more time to process (Coovert & Reeder, 1990).

Rothbart and Park's (1986) study suggests that when the initial judgment is unfavorable, only a few instances will confirm the belief while many more observations are necessary to disconfirm the belief; the opposite pattern is observed for an initial positive judgment (Baumeister et al., 2001). Likewise, Riskey and Birnbaum's (1974) study showed that once a negative impression has been made, it is difficult to counteract it by performing good actions. There is also evidence that raters are more confident in the accuracy of their judgments about someone with bad traits than they are when forming an impression of someone with good traits, again demonstrating the strength of the negative (Baumeister et al., 2001). Taken together, the evidence suggests that negative impressions are both easily made and difficult to change. On the other hand, positive impressions are difficult to acquire yet easy to lose.

Explanations for the Negativity Effect

Several theories have been put forth in effort to explain the negativity effect. First, from an evolutionary standpoint, it is necessary and beneficial for humans to weight the negative more heavily (Baumeister et al., 2001). Those who are more sensitive to the adverse are more likely to survive threats and subsequently reproduce. In order for people to learn and adapt, the effects of bad events need to last long and make an impact (Sheldon, Ryan, & Reis, 1996). Indeed people spend more time thinking about bad events than good events, and the feelings associated with negative events signal to the person that action must be taken to fix a situation (Baumeister et al.,

2001). Furthermore, the inordinate amount of cues in the environment demands that people prioritize and devote cognitive resources to the ones most important (Baumeister et al., 2001).

Kellermann (1984) discusses six theoretical explanations for the occurrence of the negativity effect in initial interactions. Three of the theories center on how positive information occurs more frequently than negative information, making the negative more powerful due to its uniqueness. The more unique or novel a cue is, or the lower base rate the behavior is, the more weight it is given in the formation of an impression (Fiske, 1980, frequency weight theory), presumably because more attention and cognitive processing is devoted to a novel stimulus. Contrast theories state that negative information is more informative due to being more extreme from normal. Most behaviors or normative behaviors tend to be socially desirable. Due to this, people possess an expectation for behaviors that are positive. This has been conceptualized as a default psychological anchor (or a positivity bias). When negative information is compared to the positive anchor, it is given more weight because of its greater deviation compared to positive information (Simpson & Ostrom, 1976, expectancy contrast theory).

Category-diagnosticity theory (Skowronski & Carlston, 1989) considers the number of dispositional categories a cue reflects. People categorize others based on available informational cues. If the cue reflects more than one category on the trait continuum, then it is ambiguous and given less weight in the impression. In other words, the informativeness of a behavior depends on its ability to discriminate between categories of dispositions (Skowronski & Carlston, 1989). Negative information is less ambiguous according to the hierarchically restrictive schema and therefore more informative than neutral or positive behaviors. For instance, negative behavior (B_2) is only predicted by a negative disposition (D_2). Thus, negative behavior is more category-diagnostic and is consequently given more weight in the impression. In contrast, positive

behavior is less informative because it can be diagnostic of different levels or either pole on the disposition continuum (Reeder & Brewer, 1979, implicational schemas). I posit that the hierarchically restrictive schema held by observers is activated in impression formation and accounts for the negativity effect in trust.

Further support for the greater diagnosticity of negative information is the idea that a categorization of bad requires only the observation of a few bad acts, whereas a categorization of good requires multiple and consistent demonstrations of good behavior. It is commonly believed that only bad people do bad things, whereas good people may do both good and bad (Baumeister et al., 2001).

Lastly, some researchers argue that negative emotions induced from trait-incongruent behaviors are also an important factor contributing to attributional weight. Behaviors from the target that violate an initial judgment of a hierarchically-restrictive (i.e., morality related) trait have been found to trigger stronger negative emotions that are significantly related to attributional weight (Trafimow et al., 2005).

In sum, one's perceptions of a teammate can determine the quality of their ensuing relationship. How these impressions are formed depends on the nature of the trait that is being judged. This study puts forth the hierarchically restrictive schema as a framework for how individuals make trust attributions based on observations of a teammate's behavior and draws on the negativity effect to hypothesize how conflicting pieces of information are weighted and combined to influence levels of trust throughout the relationship.

To recapitulate thus far, I have discussed the value and increased adoption of virtual work teams as well as the rising importance of trust in the relationships between team members. Organizational researchers have long been concerned with understanding what factors build

interpersonal trust (e.g., trustworthiness) and whether they are different in virtual versus face-to-face teams. In recent years researchers have begun to focus on the dynamic nature of trust in a relationship over time. Most attention and theorizing have been on how trust matures and progresses through stages over the course of a relationship. However, performance within virtual work teams is characterized by both displays of positive and negative behavior (for e.g., errors or CWBs). I have highlighted overwhelming evidence for the strength of the negativity effect and advocated that the influence of negative information on trust over time must also be captured and understood. Additionally, I have described the process of impression formation and how it possibly pertains to attributions of trust.

Present Study

Hypothesis 1

At the indication of a multitude of independent studies it seems reasonable to conclude that the negativity effect is a widespread phenomenon. Still, it is meaningful to delineate the scope of its generalization and where boundaries exist for this effect. The present study examines the presence of the negativity effect on trust in virtual work teams. It also investigates the adequacy of the schematic (implicit theories) model as an explanation for how trust is attributed to others by individuals within teams.

The design is a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, entity pair) x 3 (Time measurement: 1, 2, 3) mixed model ANOVA. Another way to conceptualize the design is the positive or negative mission behavior is performed by the stimulus person at two time points: first in Mission 1 and then later in Mission 2, and thus may also be regarded as time 1 behavior (positive or negative) followed by time 2 behavior (positive or negative).

The first hypothesis applies to the experimental condition that receives two pieces of information from a single source (individual condition). Hypothesis 1 states that an individual will differentially weight trustworthy and untrustworthy behaviors from a teammate, such that negatively valenced information will be given more weight when forming an impression of the target's trustworthiness. I hypothesize this because negative information is more diagnostic of a disposition due to the hierarchically restrictive schema, which dictates that negative behaviors are only attributable to a negative disposition.

Functional measurement (Anderson, 1976) suggests that if the pieces of information influencing trust are averaged or equally weighted, there should be no significant interaction effect (i.e., only main effect of A or main effect of B). However, if the negative information is given more weight in the trust attribution, as I hypothesize, then I expect to see an interaction effect between the two behavior factors. That is, there will be mean differences in trust that are not explained by the main effects. When observers are subjected to both positive and negative behaviors from an individual, they will give the negative information more weight, resulting in lower levels of trust.

Hypothesis 1: A negative behavior from a teammate will be given more weight than a positive behavior, reflected in the individual's trust levels toward that teammate, and shown by a two-way interaction between Mission 1 behavior and Mission 2 behavior.

Hypothesis 2

First impressions can carry substantial weight and set the tone for the pending relationship (Jarvenpaa & Leidner, 1999). As an extension of impression formation by way of the hierarchically-restrictive schema, it follows that once a disposition attribution has been made, expectations of subsequent behavior will take an asymmetrical form. Specifically, observers

expect only positive behaviors from positive dispositions. Consequently, if an observer witnesses an initial trustworthy behavior and categorizes the teammate as trustworthy, then the observer will expect the teammate to perform only trustworthy behaviors thereafter. With regard to untrustworthy dispositions, however, the observer will expect the teammate to exhibit a whole range of behaviors from trustworthy to untrustworthy. This asymmetry stems from the common belief that good people do not commit bad acts but bad people will do both good and bad. It is no surprise when a dishonest person performs an honest behavior (for example, a mob boss who donates money to charity), but to see an honest person engage in a dishonest act can be quite shocking (for example, a church leader who cheats on her taxes) (Reeder & Coovert, 1986). By definition, an honest person is someone who does not engage in dishonest behavior (Trafimow, 1994).

The second hypothesis of this study again applies to the experimental condition that receives two pieces of information from a single source (i.e., individual condition). Hypothesis 2 states that individuals will expect teammates initially judged as untrustworthy to subsequently behave in both trustworthy and untrustworthy ways. However, individuals will expect teammates initially judged as trustworthy to perform only trustworthy behaviors subsequently. Both hypotheses 1 and 2 will be analyzed with a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) between subjects Analysis of Variance (ANOVA). Factor 1 is an initial trustworthy or untrustworthy behavior. Factor 2 is a subsequent trustworthy or untrustworthy behavior from the same target. I will examine how these acts from a teammate influence an observer's levels of trust. The interaction effect predicted in hypothesis 1 will also serve as support for hypothesis 2. That is, I expect to see a high level of trust where both initial and subsequent behaviors are positive and a low level of trust for the condition where initial

behavior is trustworthy and subsequent behavior is untrustworthy. In other words, there should be a large mean difference in trust between the initial positive followed by subsequent positive (pos/pos) and initial positive followed by subsequent negative (pos/neg) conditions. In contrast, I do not expect to see much difference in the levels of trust when an initial negative behavior is followed by a positive behavior (neg/pos) or followed by a negative behavior (neg/neg). This demonstrates the asymmetrical expectations of behavior depending on the valence of the initial impression as theorized by the hierarchically restrictive schema.

Further support for hypothesis 2 will be exhibited by plotting the mean trust levels over the four time measurements. I expect to see that an initial positive behavior followed by negative behavior will drop trust significantly, while an initial negative behavior followed by a positive behavior will not help raise trust to the same degree (for the neg/pos experimental condition). This result demonstrates the negativity effect by way of asymmetrical expectations dictated by the hierarchically restrictive schema. Essentially, I posit that the hierarchically restrictive schema produces the negativity effect which is shown by the mean trust levels across groups receiving different stimulus sequences as well as within groups over measurement periods.

> *Hypothesis 2: Asymmetrical expectations for subsequent behavior will depend on the valence of the initial behavior, resulting in a negativity effect, shown by a two-way interaction between Mission 1 behavior and Mission 2 behavior.*

Hypothesis 3

The third hypothesis of this study addresses how individuals form trust judgments depending on whether the behaviors are emanating from a pair of unrelated persons or an entitative pair of persons with perceived unit formation. An entity is a group of individuals possessing group characteristics, such as unity and coherence (Campbell, 1958; Newhaiser et al.,

2012). Does differential *weighting* of information or *expectations of behavior* vary when the target is more than one individual? Prior research by Coovert and Reeder (1990) has shown that if a subgroup is perceived as an entity with unit formation – the perception that members share homogenous attitudes and behaviors – then the negativity effect will be present for a morality impression of the group as it is present for a morality impression of an individual. Coovert & Reeder (1990) describe the manifestation of unit formation as when the observer perceives the group of individuals as a single entity and expects consistent attitudes and behaviors from those within the group. Therefore, in the case of entitativity and unit formation, I hypothesize that the negativity effect will be similarly strong as in the case of individual targets. However, in the case without entitativity the unrelated pair is perceived as without unit formation. Thus, there is an absence of expectations about one individual's behavior based on the other individual's behavior. For instance, observers are not surprised when an immoral behavior of one person follows a moral behavior of another person (no violation of expectations) because these two people are unassociated. The observer will not hold any expectations about the second person's behavior based on what they have observed from the first person. In the absence of these expectations, observers may simply combine the behaviors of the members in the aggregate group in a piecemeal fashion, exhibited by two main effects and no interaction, rather than giving negative information more weight (Coovert & Reeder, 1990).

I expect that a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, entity pair) between subjects ANOVA will show a stronger negativity effect when the target is an individual or an entity pair of teammates compared to an aggregate pair of unrelated individuals.

Hypothesis 3: A three-way interaction effect will occur where the two way interaction between Mission 1 behavior and Mission 2 behavior varies depending on whether the behavior source is an individual, unrelated pair, or entity pair.

Chapter 2: Method

Participants

Undergraduate students from the Psychology Department Research Participant Pool (SONA) at the University of South Florida underwent this study in teams of 4. In situations where less than 3 participants arrived for the study, a research assistant was substituted in place of the missing participant. Data were collected and analyzed from a final sample of 240 participants from 134 teams. The mean age for this sample was M = 19.94, SD = 2.58. The sample was predominately female (69%). Approximately 33% of the sample was Caucasian, 23% Hispanic, 18% Asian, 14% African American, 8% Multi-Racial/Other, and 1% declined to respond.

Task

The experimental task was the Distributed Dynamic Decision Making (DDD 4.2, Aptima) Search and Rescue Simulation that required individuals to work interdependently in teams to accomplish the objectives of two missions. Each team member operated a computer simulated snowcat vehicle (Red, Green, or Purple) and completed various tasks, such as navigating the terrain and processing seismic monitors for clues to achieve the mission. Each snowcat had the ability to communicate via text chat with the other snowcats as well as Blue (home base station) in a communal chatroom. Participants were explicitly told the following information for each mission: (1) they must attempt the Emergency Task that appears at 3 minutes 20 seconds into the mission; (2) the Emergency Task requires resources that they must request from Blue; (3) each snowcat on the team must request 1 set of resources from Blue

teammate. Blue was described as another participant playing the role of 'Home Base Operator' who has the discretion to allocate resources, such as technicians and medics, in order to help accomplish the team's objectives.

Manipulation

Mission behavior. This study presented participants with positive and negative trust information in the form of stimuli statements about a target and assessed participants' levels of trust in this target.

Research suggests that the situation is less important relative to the target person's behavior when making judgments of hierarchically restrictive traits, such as morality and ability; people do tend to attribute behavior to the disposition of a person (Trafimow, 1994). For instance, in a lab study Gawronski (2003) found that when the target was situationally assigned to write an essay using a particular perspective and the essay was well-written, this behavior was perceived as high ability of the person, overriding the situational information of being assigned a particular perspective. Based on this, I can expect that trustworthiness information interjected into the experiment can be salient to impression formation.

A list of trust stimuli was developed based on the three characteristics of trustworthiness: ability, integrity, and benevolence (Mayer et al., 1995). The statements were then pilot tested with graduate psychology students who rated each item on the list as (1) very negative to (7) very positive with (4) as the neutral midpoint. Statements rated with means close to the neutral midpoint, i.e. between 3.0 and 5.0, were discarded. Next, to eliminate the potentially confounding effect of information extremity, statements with a positive valence had to be an equidistant from the midpoint as statements with a negative valence in order to be retained.

In attempt to ensure a more salient manipulation, the stimuli were presented as a response or as part of an interaction with each participant, (as opposed to low-fidelity written stimulus presented on a piece of paper). Because there was a communal chatroom and three participants on each team, Blue confederate had to deliver three differently worded, but equal in strength, stimuli statements in each mission.

The following items had an average deviation of 2.358 in the positive direction from the neutral midpoint: "yes, I'd be happy to give you those resources" (2.615), "yes, I will help you with that right now" (2.384), "yes, I can definitely do that for you" (2.077). These next three items had an average deviation of 2.333 in the negative direction from the neutral midpoint: "no, I won't help you with that" (-2.461), "no, I'm not willing to spend those resources on you" (-2.307), "no, it's not my job to help you" (-2.231). These 6 stimuli statements were selected for use in the experiment. See Table 1 for more information about the stimuli.

In response to each participant's specific request for Emergency Task resources, Blue confederate interjected the stimuli in the chatroom. A positive trust manipulation from Blue included delivering the three positive stimuli statements and a trustworthy behavior, i.e. giving the participant the requested resources. A negative trust manipulation from Blue consisted of delivering the three negative stimuli statements coupled with a lack of a trustworthy behavior, i.e., not giving the participant the requested resources. The stimuli statements served as two factors in this experiment: valence of trust information in Mission 1 (positive or negative) and valence of trust information in Mission 2 (positive of negative). Both factors were varied between subjects.

Behavior source. This study also presented participants with manipulation information about the person performing the stimulus in Mission 2. This served as the third between subjects

factor, behavior source with three levels: individual, unrelated pair, entity pair. Teams in the individual behavior source condition received both Mission 1 and 2 stimuli from one target, "Blue," who was described as another study participant playing the mission as their teammate. Individual participants' overall level of trust in Blue was assessed at baseline, after Mission 1, and after Mission 2.

Teams in the unrelated-pair condition received stimuli from Blue confederate in Mission 1 and stimuli from the same confederate described as an unrelated person in Mission 2 (i.e., a pair of unrelated individuals). Participants' level of trust in the pair of targets as a whole was assessed after Mission 2. (See Appendix F for the document presented to participants.) Specifically, the manipulation information read:

> Before you depart, the operator at Blue Station who worked as your teammate in Mission 1 has left and been replaced by another operator (i.e., by another study participant). Your new teammate is not related to nor associated with Blue Operator from the 1st mission. They have not spent any time together. This person will now join your team as Blue Station Operator.

In the third level of this factor, participants received stimuli from the confederate (Blue) in Mission 1 and stimuli again from Blue in Mission 2 but this time described as a close friend of the first Blue (i.e., an entity pair with unit formation). Participants' level of overall trust in the pair of targets as a whole was assessed after Mission 2. (See Appendix G for the document presented to participants.) Specifically, the manipulation information read:

> Before you depart, the operator at Blue Station who worked as your teammate in Mission 1 has left and been replaced by another operator (i.e., by another study participant). Your new teammate is a close friend and colleague of Blue Operator

from the 1st mission. They have spent a lot of time together and are very similar.

Manipulation information was presented to participants as part of a mission briefing document that contained background information, objectives, and instructions for the mission. This mission briefing document was left on the table with the participant for easy reference during the mission.

As a manipulation check for this variable, participants responded to the statement, "In the mission you are about to play (mission 2), the person operating Blue station is…" by selecting one of the following response options: "the same person in mission 1," "a close friend of the person in mission 1," or "not associated with the person in mission 1." Additionally, a short survey was administered to assess how much they perceived unit formation and group entitativity based on just reading the manipulation (i.e., the mission briefing). Unit formation is the perception that members of a group are a single entity who share consistent attitudes and behaviors (Coovert & Reeder, 1990). Entitativity is conceptualized as "groupness" or the extent to which groups of individuals are regarded as real groups with group properties, such as unity and coherence, as opposed to mere aggregates of individuals (Campbell, 1958; Newhaiser et al., 2012). Participants rated on a scale of 1 to 7 their agreement with these statements, "Blue in Mission 1 and Blue in Mission 2 are tightly knit," "know each other well," "have unity," "have the same attitudes," and "have the same behaviors."

Measures

Trust. (Appendix A). This study used McAllister's (1995) trust measure because of the recognition and support for McAllister's (1995) two factor model of cognitive and affective based trust and the rigor with which survey items were generated and validated (McEvily &

Tortoriello, 2011). Please refer to Appendix A for this measure adapted for the experiment. Item wording was slightly modified for the context of this experiment. For example, "This person approaches his or her job with professionalism and dedication" was changed to "This person approaches the mission with professionalism and dedication." Participants responded on a seven-point Likert scale (1 = Completely Disagree to 7 = Completely Agree). Participants completed this measure, rating their level of trust in Blue teammate, three times in the experiment (T1 baseline, T2 after Mission 1, and T3 after Mission 2).

Procedure

When participants arrived at the research laboratory they were immediately escorted by the experimenter into one of three experiment rooms with closed doors. This was done to prevent any face-to-face interaction among the participants and to minimize the amount of information participants have about one another prior to the experiment. It is particularly important for a study examining impression formation and trust to control for these confounds. The door to each experiment room was closed for the duration of the experiment, except for when the experimenter needed to enter to instruct the participant on study procedures. Again, this was done so that participants did not communicate to each other face-to-face during the study. To simulate virtuality, participants in this study were only allowed to communicate with each other through the DDD text-based chat tool.

Each participant's experiment room consisted of a computer running DDD 4.2, a keyboard, and a mouse. Participants were seated at the desk in front of these materials. After completing informed consent procedures, participants were oriented on the mechanics of the game via a 10 minute training video that taught them the game controls, e.g., what mouse buttons to click and where to click to perform the necessary functions of the game. A printed instructions

sheet with the same information (i.e., a quick guide) accompanied the video and was given to participants to read. Following the video, participants were given a chance to practice performing the functions explained in the video. The experimenter ensured that participants understood how to perform eight basic functions of the game that were taught in the video and also ensured that they successfully performed the functions at least once in the practice session prior to starting the actual missions.

Next, participants were instructed to take the baseline trust survey. Subsequently, they were presented with briefing information for Mission 1. As summarized above, this briefing document clearly stated in succinct sentences, the participant's role, mission situation, objectives (e.g., the emergency task, the object of interest to locate, and the lost party of crewmembers that they must rescue), and instructions about requesting resources from Blue for the emergency task. Participants were instructed to use the chatroom to request 1 set of resources from Blue when the emergency task appears at 3:20 on the mission clock. Participants were also told that their team is awarded points for accomplishing mission objectives. Before proceeding with the actual mission, the experimenter verbally checked that participants understood the information presented in the mission briefing.

Participants were given 30 minutes to play Mission 1. During the mission, a research confederate played as Blue teammate. The only action Blue performed in the mission was inserting trust stimuli in the chatroom. The stimuli were positive or negative depending on the experimental condition. Each participant (Red, Green, Purple) individually used the chat tool to ask Blue for resources, as instructed. Blue responded to each participant with one stimulus statement. Given that there were three participants who each requested resources in a communal text-based chatroom, Blue responded a total of three times in the mission, and thus, each

participant was exposed to exactly three stimuli statements. All three statements in the mission were of the same valence. To reinforce the idea that they were talking to a real person in the chatroom, and perhaps improve the fidelity of the simulation, Blue confederate individually addressed the stimulus response to the participant who requested resources (although, all members of the team could read Blue's responses in the communal chatroom). Doing so may also have assisted in ensuring that participants attended to the manipulation. For example,

Red (participant): "Blue, can I have 1 set of resources?"

Blue (confederate): "no Red, it is not my job to help you"

After 30 minutes had elapsed for Mission 1, participants completed the time 2 trust measure. They also completed a manipulation check for the valence of the trust stimuli (positive or negative) received in Mission 1. Specifically, participants were asked to report whether Blue did or did not give them the resources they requested. This was designed to assess if they acknowledged that Blue teammate gave them a positive or negative response. Next, participants read the Mission 2 briefing. Similar to the one before, this briefing described the mission situation and explicated the same instructions for the emergency task. Mission 1 and Mission 2 varied only in terms of name and location of certain objects; however, everything else was invariant, including mission difficulty and all aspects of the emergency task.

Participants who were in the entity-pair condition or the aggregate-pair condition were given an additional paragraph of information about Blue as reported in the manipulation section of this paper. After reading the behavior source manipulation, participants completed a manipulation check that asked whether Blue teammate from Mission 1 and Blue teammate from Mission 2 are the same person, close friends, or not associated with each other. In addition to

this, participants completed the short survey assessing the amount of unit formation and entitativity perceived from reading the manipulation.

Prior to playing Mission 2, the experimenter again checked that all participants understood the mission objectives and instructions. Participants played Mission 2 for 30 minutes. A research confederate played as Blue and performed the role in the same way as described for Mission 1. Following Mission 2, participants completed the time 3 trust measurement as well as the manipulation check for the valence of the trust stimuli (positive or negative) received in Mission 2. Participants were asked whether Blue did or did not give them the resources they requested. Again, this was to assess whether the participant acknowledged Blue's positive or negative response. After completing the measures, participants were debriefed about the deception in the study (i.e., the confederate and scripted behaviors), compensated with SONA points, and dismissed.

Design

This study had four factors in a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, or entity pair) x 3 (Time: baseline, after Mission 1, after Mission 2) mixed model design. The first three factors were varied between subjects while the last factor was within subjects. The first factor was valence of the response (positive or negative) from Blue in Mission 1. The second factor was valence of the response (positive or negative) from Blue in Mission 2. The third factor was behavior source: individual Blue performing both the behaviors in the two missions, a pair of unrelated individuals each performing one of the behaviors, or a pair of entitative individuals each performing one of the two behaviors. This produced 12 between-subjects experimental groups.

The fourth factor was time consisting of three time points (a repeated measures variable). Teams were randomly assigned to 1 of the 12 experiment conditions, and for each team trust was measured at three time points (T1, T2, T3). For example, a team that was randomly assigned to the "pos/neg/individual" condition was comprised of 3 participants and 1 research confederate. In Mission 1, the research confederate delivered positive stimuli statements, while in Mission 2 the research confederate delivered negative stimuli statements. As another example, a team that was randomly assigned to the neg/neg/entity pair condition was similarly comprised of 3 participants and 1 research confederate. The research confederate delivered negative stimuli in the chatroom during both Missions 1 and 2; however, in Mission 2, the confederate was described to participants as a close friend and colleague of the first Blue rather than as the same individual.

To examine the negativity effect (hypothesis 1) and asymmetrical expectations (hypothesis 2), a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) between subjects ANOVA was performed. To examine whether this interaction effect varied by behavior source (hypothesis 3), a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, entity pair) between-subjects ANOVA was performed. Lastly, to examine the negativity effect from a within-person level, i.e., if the pattern of trust changes over time (negativity effect) differed by behavior source, a 4 (Stimuli sequence: pos/neg, neg/pos, pos/pos, neg/neg) x 3 (Time: 1, 2, 3) x 3 (Behavior source: individual, unrelated pair, entity pair) mixed model ANOVA was performed.

Overall, this experiment was designed to investigate evidence for a widespread phenomenon, the negativity effect, in the particular context of trust in virtual work teams. Using

DDD as a platform for virtual teamwork and computer mediated communication, I examined how individuals integrate multiple (and sometimes conflicting) pieces of information about a teammate or teammate pair. Additionally, the design of the study was structured such that the influence of such information could be examined at a between-person level, i.e., observing trust at Time 3 after both pieces of information have been received and integrated, as well as at a within-person level, i.e., observing how trust changes at each time point after receiving a piece of information about the teammate.

Chapter 3: Results

Data Preparation

One item from the Trust measure (item 5: "if people knew more about this person and his/her background, they would be more concerned and monitor his/her performance more closely") was reverse coded, such that a rating of: 1=7, 2=6, 3=5, 4=4, 5=3, 6=2, and 7=1. Three manipulation checks were used in this experiment to check that participants attended to Blue's response in Mission 1, Blue's response in Mission 2, and how related the pair of persons was in Mission 1 and Mission 2. These manipulation checks were reported in more detail in the Method section above. A total of 22 subjects (6% of all participants collected) failed 1 or more of the 3 manipulation checks and were excluded from subsequent analyses.

Participants were randomly assigned to experimental groups that did not interact with each other, and each participant independently completed the Trust measures. Thus, Trust in Blue at Time 3 should meet the assumption of independence of observations. Next, the distribution of Trust in Blue at Time 3 for each experimental group was examined to detect outliers and meet the assumption of normality. One indication of an outlier is when a data point is 3 standard deviations (or 2.5 standard deviations) from the mean (Stevens, 2009, p.14). Another definition for an outlier is an extreme value beyond 1.5 times the interquartile range (IQR=Q3-Q1). Based on this rule, boxplots were generated showing the following data points as outliers (z-score also reported in parentheses), and they were excluded from subsequent analyses. The first outlier (z = -2.61) was identified in group 3 (pos/pos/ind); 2 outliers (z = 3.06 and z = 2.71) in group 4 (neg/neg/ind); 3 outliers (z = 2.14) in group 6

(neg/pos/unrelated); 3 outliers (z = 2.77, z = 2.08, z = 1.95) in group 8 (neg/neg/unrelated); 3 outliers (z = 2.98, z = 2.24, z = 1.37) in group 12 (neg/neg/entity).

Data were collected from a sample of N= 344. After the 12 outlier cases and 22 failed manipulation cases were excluded, the sample was reduced to N=310. Next, given that the smallest experimental condition had a sample size of 20, 20 cases were randomly sampled from all the larger experimental groups to create a balanced design (i.e., equal number of observations across all the conditions); this resulted in a total sample size of N=240.

Following this, normality tests using the Shapiro-Wilk statistic were conducted in SPSS for each of the 12 experiment conditions from the 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, entity pair) design. Only two groups showed evidence of non-normality: group 10 (neg/pos/unrelated) and group 12 (neg/neg/unrelated). Trust showed a right skew distribution for both group 10 ($W = .89$, $p<.05$) and group 12 ($W = .80$, $p<.05$). Given that a balanced model with sufficiently large cell sizes was used, and that their departure from normality was not extreme (skewness and kurtosis values were between -1 and +1, with values closer to zero demonstrating normality), then minor violations of normality should not severely affect the results (Stevens, 2009).

Lastly, the assumption of homogeneity of variance was tested using Levene's test, $F(11, 228) = 7.484$, $p<.05$. This significant result suggested that error variances across experiment groups were not equal. Some subscribe to the rule that if the largest variance is not 3 to 4 times larger than the variance of the smallest, then ANOVA remains robust to violations of this assumption. It is more commonly agreed, however, that if a balanced design with approximately equal cell sizes is used then violating this assumption should not have a large effect on the results

(Stevens, 2009, p.227; Keppel et al., 1992 cited by Meyers, Gamst & Guarino, 2012). These violations, however, should still be noted when drawing conclusions from the analyses because it is possible that the nominal alpha level (Type I error rate) becomes distorted when assumptions are violated.

Descriptive Statistics

See Table 2 for descriptive statistics for Trust at Time 1, 2 and 3 by experiment group. It is interesting to note that the neg/neg conditions (groups 4, 8, 12) present small variability in scores at Time 2 and Time 3 but not at Time 1 (baseline). These findings makes sense in relation to impression formation and the hypothesized negativity effect. That is, ratings of trust after receiving two instances of negative behavior from the target exhibit small variability, indicative of the strength and diagnosticity of negative information. Internal consistency reliability (alpha coefficients) ranged from .89 to .96. Alpha for trust at Time 1 (11 items) across the 12 groups was .89 (N=240), at Time 2 alpha was .96 (N=240), and at Time 3 alpha was .96 (N=240).

Hypothesis Testing

A 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) between subjects ANOVA was conducted with Trust in Blue at Time 3 as the dependent variable to test the negativity effect hypothesis. This hypothesis states that individuals differentially weight trustworthy and untrustworthy information from one teammate, such that negative information is given more weight in the impression of the target's trustworthiness. This should be evidenced by an interaction effect between the two Mission behavior factors. The two-way ANOVA yielded a main effect of Mission 1 behavior, $F(1, 76) = 48.11$, $p<.05$, showing that trust was significantly higher when noting a positive response from the individual teammate (M=42.40) than when receiving a negative response (M=28.13). There was also a similar main

effect of Mission 2 behavior, $F(1, 76) = 205.12$, $p<.05$ (positive $M=50.00$ and negative $M=20.53$). Thirdly, there was a significant ordinal interaction, $F(1, 76) = 7.21$, $p<.05$, where the "pos/neg" condition had a lower mean ($M=24.90$) than what was expected with simple averaging, suggesting that negative information is given more weight than positive information. If simple averaging of the behaviors took place as opposed to differential weighting of the negative behavior more, then there would be a lack of an interaction effect and the line graph would exhibit parallel lines. Instead, as hypothesized, these results do indeed show an interaction effect and the graph shows a lack of parallel lines (see Figure 2). Accordingly, hypothesis 1 regarding the negativity effect was supported.

Hypothesis 2 posits that people hold asymmetrical expectations of subsequent behavior based on an initial behavior or judgment of that person. Support for this hypothesis is also shown by an interaction effect between the two behavior factors. As reported above, there was a significant interaction found, $F(1, 76) = 7.21$, $p<.05$. There was a large mean difference in trust between the "pos/pos" and "pos/neg" conditions (mean difference = 35). In comparison, there was a small mean difference in trust between the "neg/pos" and "neg/neg" conditions (mean difference = 23.95). This suggests that the effect of the second behavior depends on the valence of the first behavior from the same person. When the first behavior was positive followed by a subsequent negative behavior, this resulted in low trust (24.90, due to expectations violated), a sharp contrast to the very high trust reported when the subsequent behavior was positive (59.90). However, when the first behavior was negative, the difference in trust between receiving a subsequent positive behavior (40.10) and negative behavior (16.15) was much smaller (i.e., no expectations violated; a positive behavior is less diagnostic and subsequent behavior could be

either positive or negative). This lends support to the second hypothesis regarding asymmetrical expectations. (See Figure 3).

Further support for the negativity effect and asymmetrical expectations (hypothesis 1 and 2) was shown by plotting the mean trust levels for the experiment groups who received both behaviors from the same person over the 3 trust measurement times. As can be seen in Figure 4, a positive behavior in Mission 1 followed by a negative behavior in Mission 2 dropped trust substantially. Yet, a negative behavior followed by a positive behavior did not help raise trust to the same extent.

Hypothesis 3 states that individuals will not hold asymmetrical expectations of subsequent behavior based on observation of an initial behavior for two persons lacking entitativity (or in the absence of unit formation). Accordingly, there should be a three-way interaction effect, where the negativity effect is stronger in conditions receiving the two behaviors from the same individual or a pair of related individuals than a pair of unrelated individuals. A 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) between subjects ANOVA showed no significant interaction effect for those who received stimuli information from a pair of unrelated individuals, $F(1, 76) = .05$, $p=.83$. This might lend some support to hypothesis 3 because it was posited that there should not be an interaction effect (i.e., no negativity effect) when the two behaviors come from an unrelated pair of stimulus persons. That is, the effect of the second behavior does not depend on the first behavior; the mean difference between pos/pos and pos/neg is the same as the mean difference between neg/pos and neg/neg, resulting in parallel lines. See Figure 5 for the lack of interaction between the two behaviors.

To directly test hypothesis 3, whether the negativity effect varies depending on the behavior source, a 2 (Mission 1 behavior: positive or negative) x 2 (Mission 2 behavior: positive or negative) x 3 (Behavior source: individual, unrelated pair, entity pair) between subjects ANOVA was performed. Results, however, reveal no significant three-way interaction effect, $F(2, 228) = 2.13$, p=.12. Based on this result, hypothesis 3 was not supported.

A similar lack of a two-way interaction (Mission 1 behavior x Mission 2 behavior) was found for those who received stimuli information from a pair of related individuals with entitativity, $F(1, 76) = .01$, p=.93. See Figure 6. This result does not support hypothesis 3 because it was hypothesized that the same asymmetrical expectations for subsequent behavior should be present if two behaviors stem from two people who are seen as an entity with unit formation.

Mean trust levels were plotted for experimental conditions that rated their trust in a pair of unrelated and entity stimulus persons over the 3 trust measurement times. See Figures 7-8. Similar to the individual condition, both plots show that trust changes more prominently after the interjection of a negative behavior (regardless of whether in Mission 1 or Mission 2). Furthermore, a positive behavior in Mission 1 followed by a negative behavior in Mission 2 led to a sharp decline in trust at Time 3. In contrast, a negative behavior followed by a positive behavior did not raise or change trust to the same extent. This may be taken as some evidence for the negativity effect from a within-person level of analysis.

Finally, a 4 (Stimuli sequence: pos/neg, neg/pos, pos/pos, neg/neg) x 3 (Time: 1, 2, 3) x 3 (Behavior source: individual, unrelated pair, entity pair) mixed model ANOVA was performed to examine trust over time as a function of stimuli sequence and behavior source. Mauchly's test of sphericity was significant, $W =$, χ^2 (df) =, $p<.05$. The Greenhouse-Geisser estimate of sphericity

was $\epsilon = .97$ (greater than .75); therefore, the Huynh-Feldt correction was used for interpreting the main effect of Time (repeated measures variable) and the interaction effect. There was a significant main effect of time, $F(2, 456) = 270.04$, $p<.05$. This indicates that ignoring experiment conditions, trust was different at the three time points. Pairwise comparisons for the main effect of time with Bonferroni adjustments show that there was a significant difference between Time 1 (M=51.50) and Time 2 (M=39.53), Time 2 and Time 3 (M=36.64), as well as Time 1 and Time 3.

Secondly, there was a main effect of stimuli sequence (pos/neg, neg/pos, pos/pos, neg/neg), $F(3, 228) = 104.42$, $p<.05$. All pairwise comparisons were significant at the .05 level. There was no significant main effect of behavior source (individual, unrelated pair, entity pair), $F(2, 228) = 1.042$, $p>.05$. However, of most interest was the significant three-way interaction among time, stimuli sequence, and behavior source, $F(12, 456) = 2.24$, $p<.05$. Line graphs depict the interactive effect of time and behavior source on trust varies depending on the stimuli sequence received (plotting interaction of time and behavior source for each stimuli sequence separately; see Figure 9).

However, plotting the interaction of time and stimuli sequence for each behavior source separately (Figure 10) shows that the interactive effect of time and stimuli sequence does not vary across the three behavior source conditions. Thus, results from the mixed model ANOVA do not support hypothesis 3. All three line graphs show some evidence of the negativity effect despite the study's claim that the unrelated-condition would not show the negativity effect. These are the same line graphs of trust over time reported earlier (Figures 4, 7, 8 are combined in Figure 10).

Overall, hypothesis 1: negativity effect in the individual condition (two behaviors from one source) as shown by the two-way interaction effect was supported. Hypothesis 2: asymmetrical expectations of subsequent behavior based on an initial behavior, also shown by the two-way interaction, was supported. Hypothesis 3: stronger negativity effect in the individual and entity pair conditions than in the unrelated pair condition, was not supported, as evidenced by a lack of a significant three-way interaction.

Additional mixed model ANOVA with time as a repeated measures variable (i.e., examining trust over time for each experiment condition) showed some evidence for the negativity effect, which was visible in the graphs for experiment groups in all three behavior source conditions (individual, unrelated, entity). Despite this, the between-subjects two-way interaction between Mission 1 behavior and Mission 2 behavior did not reach statistical significance for the unrelated condition or for the entity condition. These results provide mixed support for the study's hypothesis.

To summarize these mixed findings, for the unrelated condition, it was hypothesized that there would be no negativity effect. Results show no significant two-way interaction (between subjects), in line with the hypothesis. This result is inconclusive, however, because failing to reject the null does not prove the null, only that the null cannot be rejected. Next, plots from the mixed model ANOVA show trust drops sharply after the interjection of negative stimuli, which does not support the hypothesis. These plots (Figure 10) appear to provide some visual evidence of the negativity effect, but they are not inferential tests of the hypothesis.

For the entity condition, it was hypothesized that there would be a negativity effect. Results show no significant two-way interaction (between subjects), which fails to support the hypothesis. Yet, plots from the mixed model ANOVA show trust drops sharply after negative

stimuli, once again providing some visual support for the hypothesis. The discussion section will address possible reasons why the negativity effect (a two-way interaction) was absent for the entity condition, contrary to the claim made in hypothesis 2.

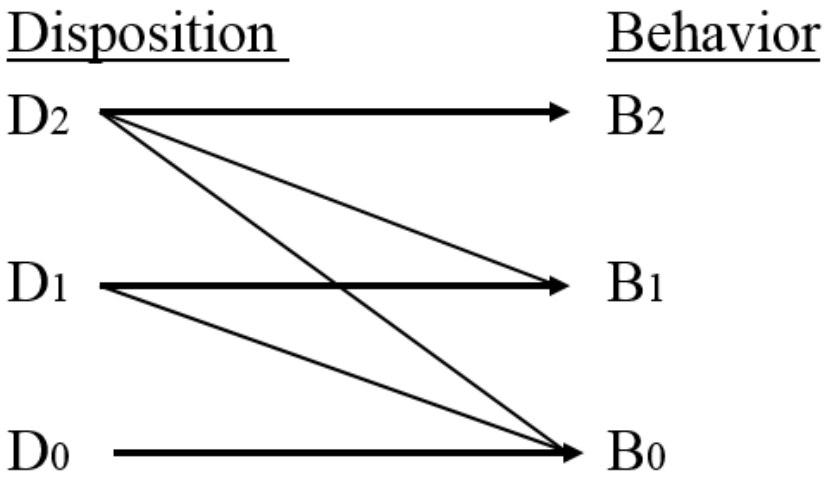

Figure 1. Hierarchically Restrictive Schema.*

** Subscript 2 represents an extreme level of the disposition or behavior. A subscript of 1 represents a moderate level of the disposition or behavior. A subscript of 0 represents a very low level of the disposition or behavior.*

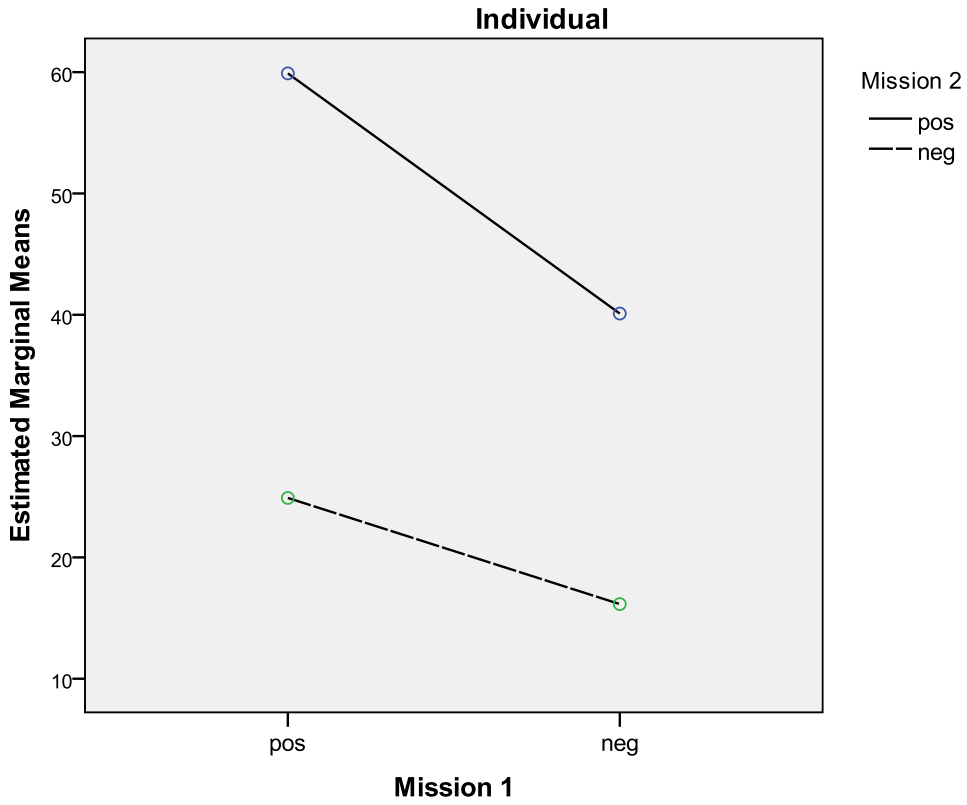

Figure 2. Trust in Blue Target as a Function of Mission 1 Behavior and Mission 2 Behavior.

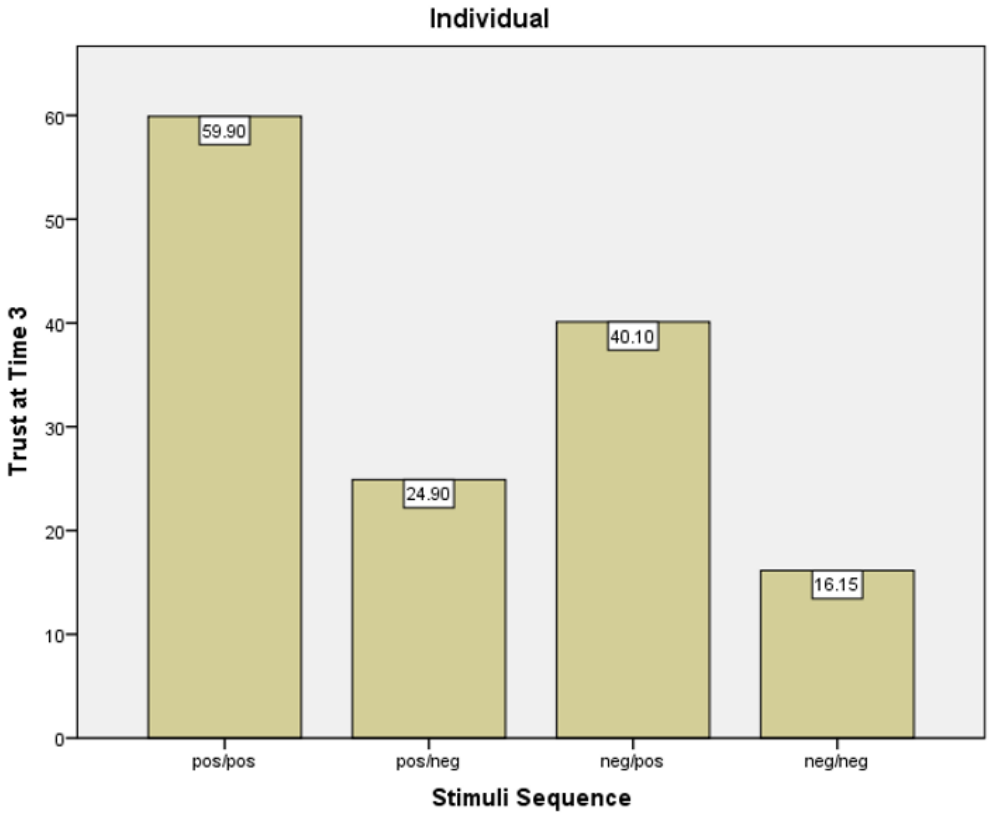

Figure 3. Trust in Blue Target by Experiment Condition.

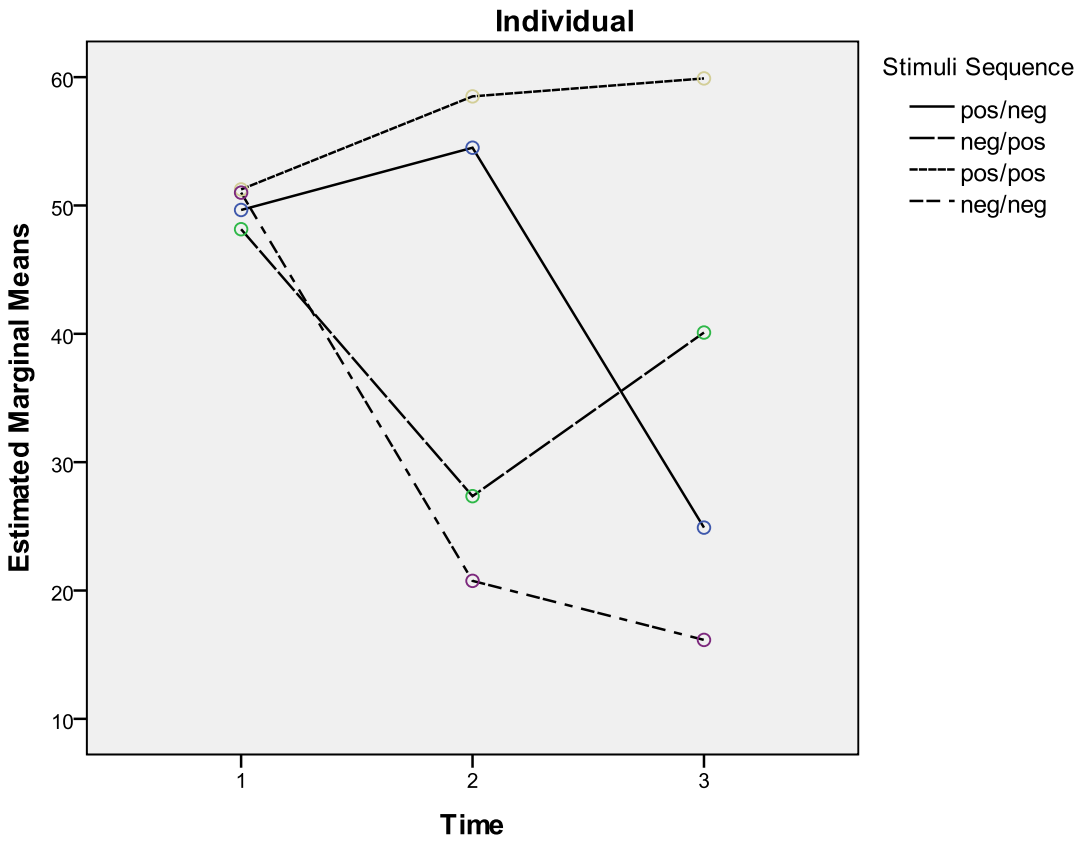

Figure 4. Trust in Blue Target over Time for Individual-condition Teams.

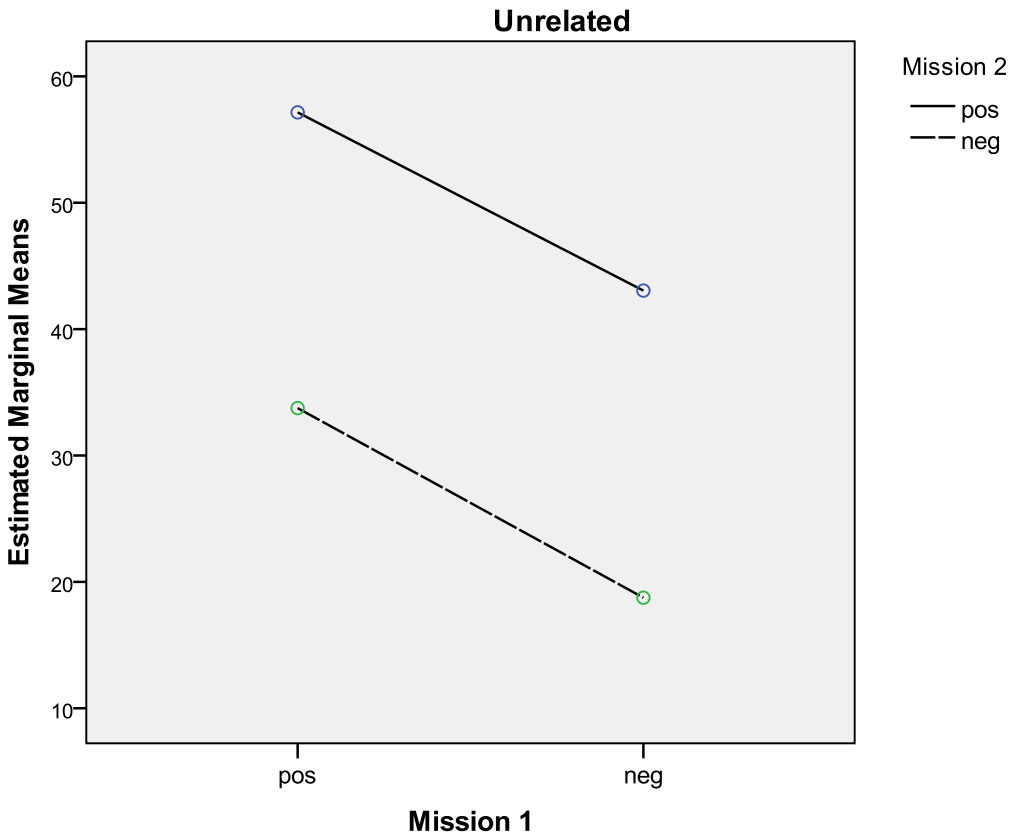

Figure 5. Trust in Unrelated Pair as a Function of Mission 1 Behavior and Mission 2 Behavior.

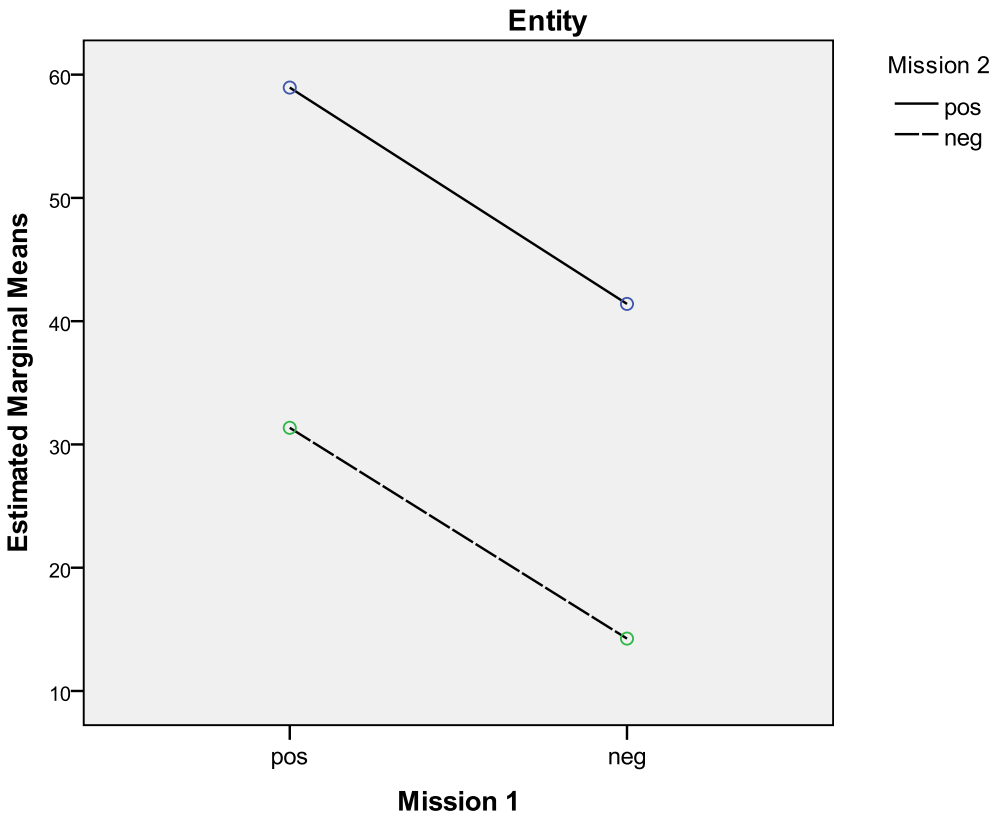

Figure 6. Trust in Entity Pair as a function of Mission 1 Behavior and Mission 2 Behavior.

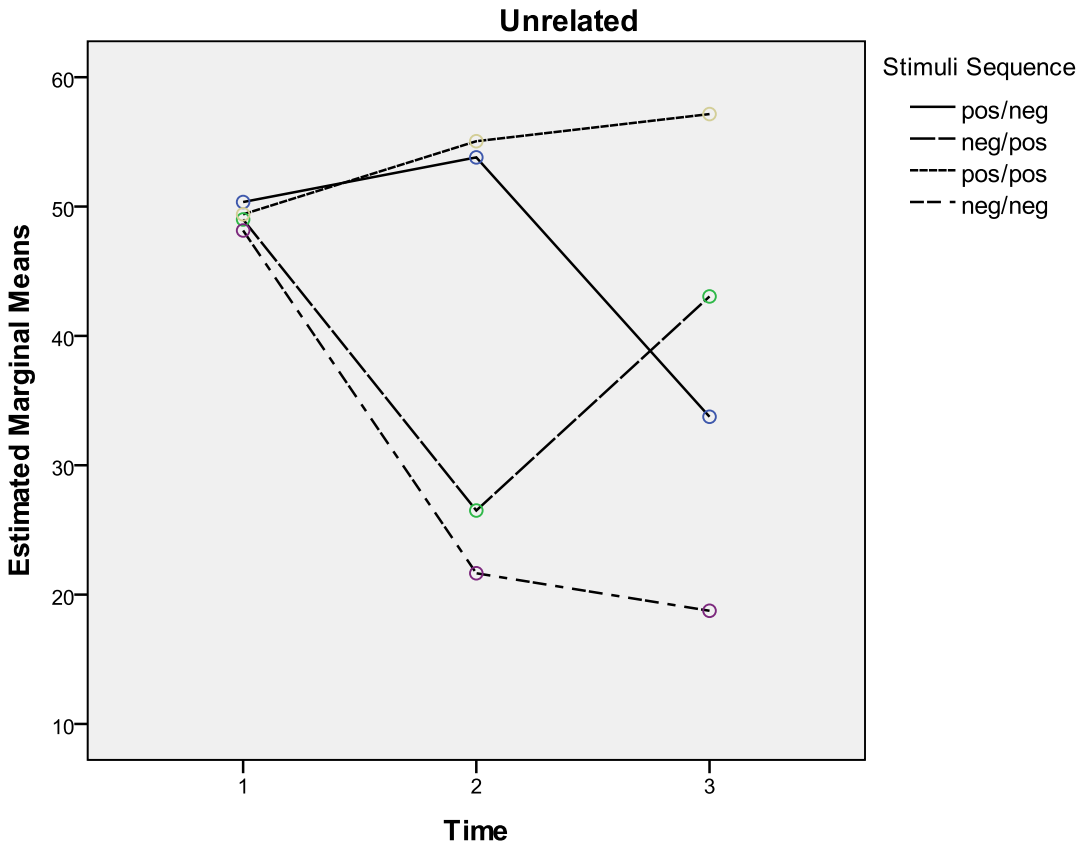

Figure 7. Trust in Unrelated Pair over Time.

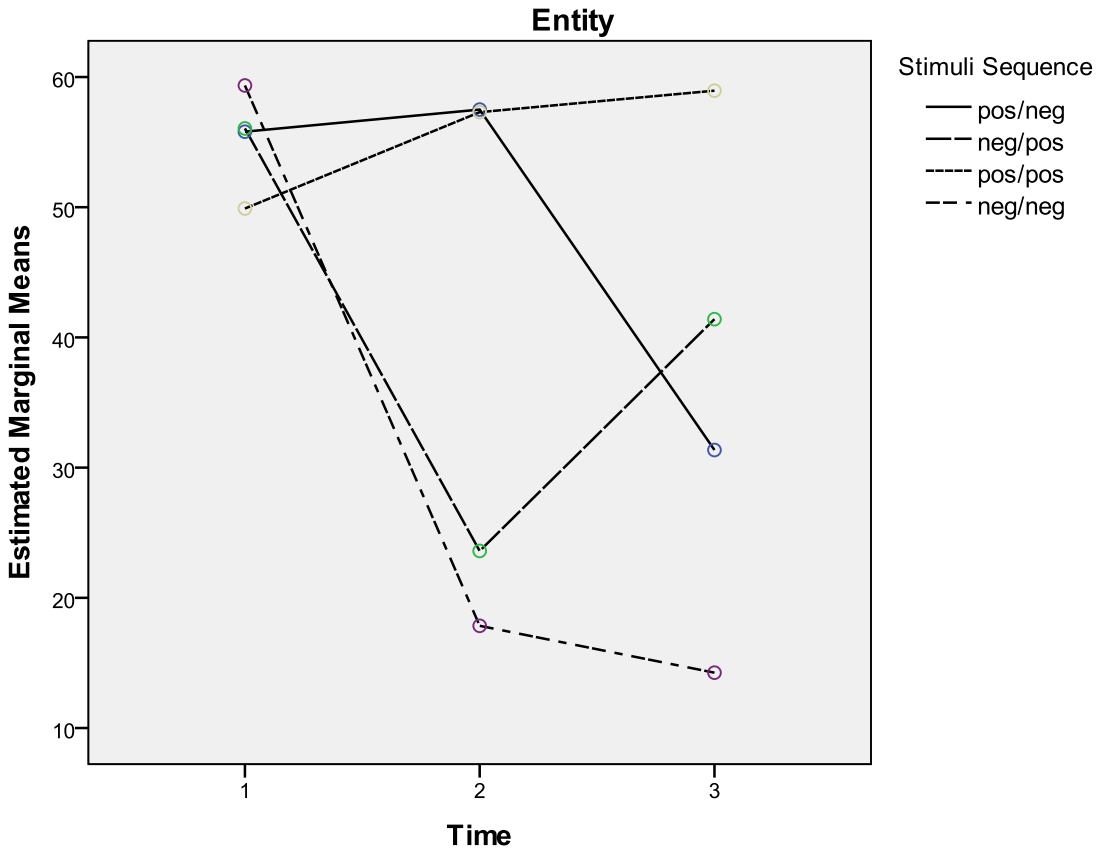

Figure 8. Trust in Entity Pair over Time.

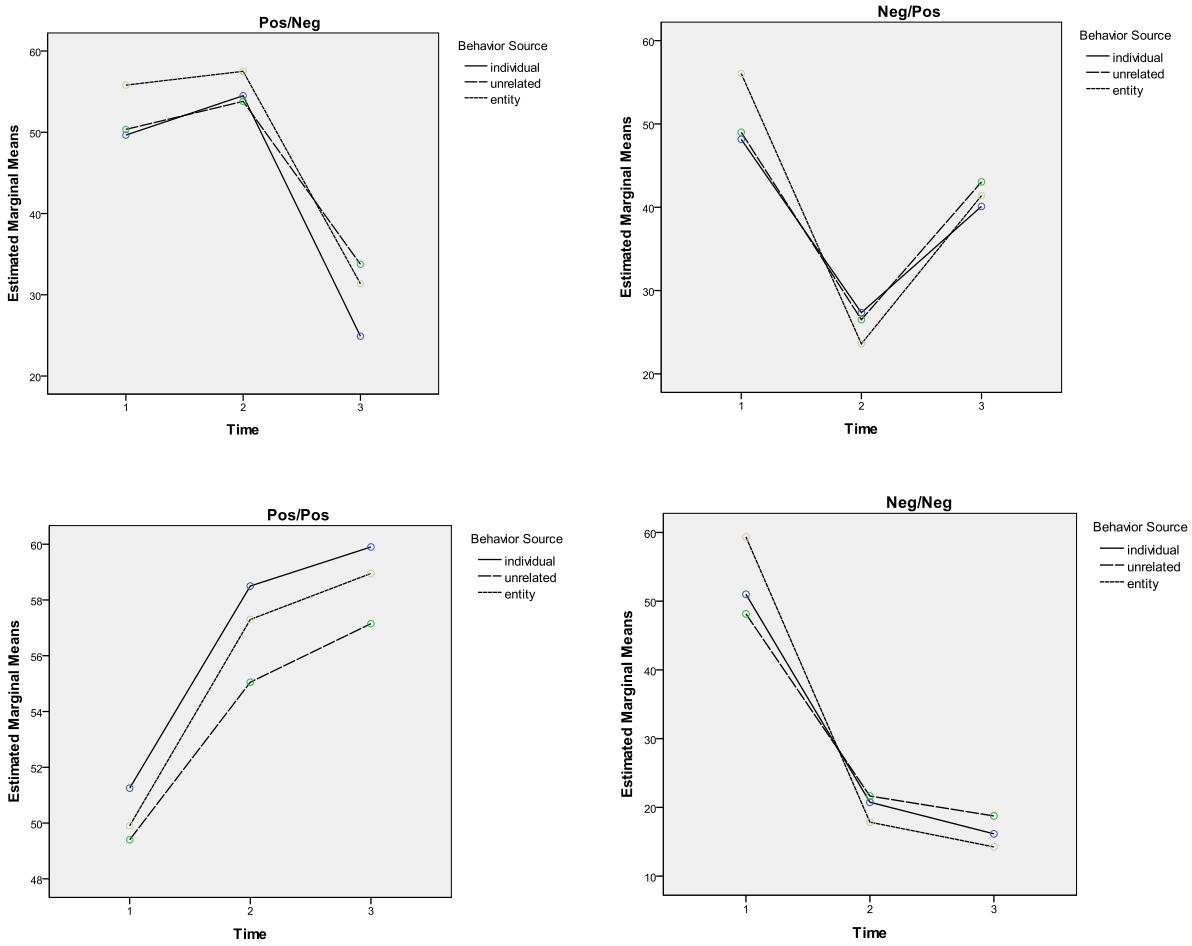

Figure 9. Interaction of Time and Behavior Source for Each Stimuli Sequence Separately.

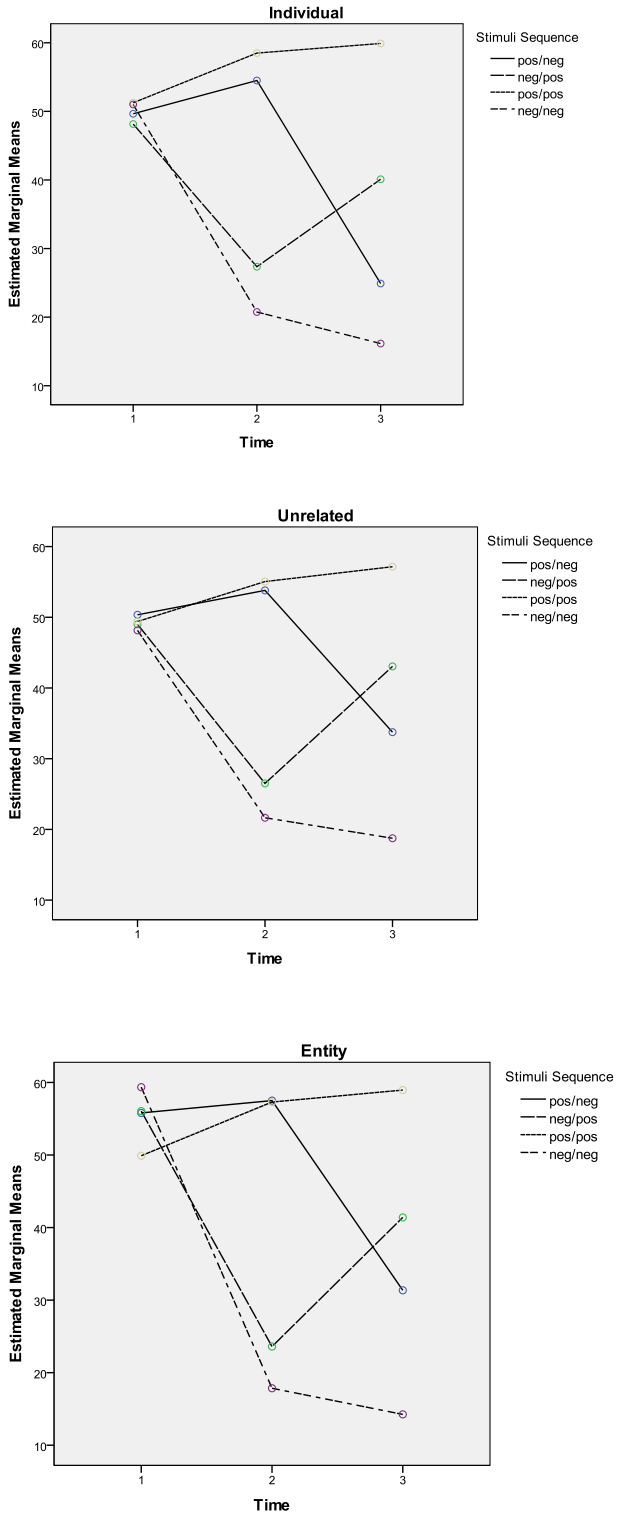

Figure 10. Interaction of Time and Stimuli Sequence for Each Behavior Source Separately.

Table 1
Descriptive Statistics for Stimuli Statements

	Stimulus Statement	**Mean (scale 1-7)**	**Distance from Scale Midpoint**	**Distance from Scale Endpoint**
Positive Valence	yes, I'd be happy to give you those resources	6.62	2.62	0.39
	yes, I will help you with that right now	6.39	2.38	0.62
	yes, I can definitely do that for you	6.08	2.08	0.92
		6.36	2.36	0.64
Negative Valence	no, I won't help you with that	1.54	2.46	0.54
	no, I'm not willing to spend those resources on you	1.69	2.31	0.69
	no, it's not my job to help you	1.77	2.23	0.77
		1.67	2.33	0.67

Table 2
Descriptive Statistics for Trust in Blue

	Group	N	Baseline: Trust Time 1		After Mission 1: Trust Time 2		After Mission 2: Trust Time 3	
			Mean	SD	Mean	SD	Mean	SD
Individual	1: pos/neg/ind	20	49.65	13.75	54.50	12.10	24.90	8.07
	2: neg/pos/ind	20	48.15	11.18	27.35	10.47	40.10	10.41
	3: pos/pos/ind	20	51.25	12.43	58.50	10.21	59.90	12.28
	4: neg/neg/ind	20	51.00	8.66	20.75	6.47	16.15	3.83
Unrelated Pair	5: pos/neg/unrel.	20	50.35	9.59	53.80	9.35	33.75	12.29
	6: neg/pos/unrel.	20	49.00	6.92	26.50	9.66	43.05	8.65
	7: pos/pos/unrel.	20	49.40	7.14	55.05	7.76	57.15	10.55
	8: neg/neg/unrel.	20	48.15	12.31	21.65	6.48	18.75	4.41
Entity Pair	9: pos/neg/entity	20	55.80	9.18	57.50	10.55	31.35	10.68
	10: neg/pos/entity	20	56.05	10.24	23.60	12.60	41.40	16.14
	11: pos/pos/entity	20	49.90	11.21	57.30	12.27	58.95	11.01
	12: neg/neg/entity	20	59.35	11.73	20.08	6.84	14.25	3.73

Chapter 4: Discussion

The objective of this study was to examine interpersonal trust as a function of positive and negative interactions between team members in a virtual team context. Based on the proliferation of evidence for the negativity effect across a range of domains (Baumeister et al., 2001), it was hypothesized that individuals observing multiple behaviors from a teammate would demonstrate the negativity effect (weight the negative behavior more) when asked to make an overall judgment of their trust in that teammate. Furthermore, the hierarchically restrictive schema was offered as a theoretical explanation for why the negativity effect would occur. The hierarchically restrictive schema posits how people relate behaviors to dispositions. As shown for morality, immoral dispositions are behaviorally unrestricted and associated with performing a range of positive and negative behaviors. In contrast, moral dispositions are behaviorally restricted and perform only positive behaviors (Skowronski & Carlston, 1987). Accordingly, this study hypothesized that people would hold such asymmetrical expectations of subsequent behavior based on an initial behavior observed related to the trustworthiness disposition. When those expectations are violated, i.e., a positive behavior followed by a negative behavior, then a strong negativity effect would be reflected in the observer's trust levels toward the teammate performing the behaviors. In the case of two behaviors coming from two separate teammates, asymmetrical expectations about the second teammate's behavior should not apply if they are perceived without entitativity or unit formation. It was hypothesized that one person's behavior would not be indicative of the second person's behavior, and thus the negativity effect would not be present in the observer's trust levels. This study found evidence for the negativity effect such

that an individual's overall trust in a teammate was more influenced by the negative behavior than an equal in strength positive behavior. This study also found support for the role of the hierarchically restrictive schema and asymmetrical expectations in producing the negativity effect. However, this study did not find conclusive support for the hypothesis regarding entitativity.

Trust in the Virtual Context

First, this study shows that people tend to have a slightly positive, rather than neutral, baseline trust in team members prior to any interaction with them. This is in line with the presumption of trustworthiness view (McKnight et al., 1998) as opposed to the view of a baseline of zero trust (Jones & George, 1998). Secondly, this level of trust can drastically change in different directions over a very short period of time (e.g., 2-3 hours) and as a result of only a few interactions (e.g. 1-2 behaviors). These findings loosen the bulwark behind the argument that trust is particularly challenging or time consuming to develop in virtual teams (media richness theory, Daft & Lengel, 1986 and social presence theory, Short et al, 1976). Instead, they suggest that physical presence is not a necessary ingredient for trust. Without any face to face contact, members of a virtual team and of a temporary team can still establish trust very quickly.

Moreover, these findings counter many of the proposed reasons for why trust is stifled or inferior in virtual teams. For example, the virtual context provides: limited experiences for observation and interaction rendering teammates' task and technological competence unpredictable; a lack of social and nonverbal cues resulting in more difficult communication; and fewer bonding opportunities through informal interaction which can hinder relational linkages and trust development, TIP theory, McGrath, 1991). While these aspects describe the virtual context of this study, they did not prohibit trust from forming. On the contrary members of

virtual temporary teams can begin by holding slightly positive trust and then quickly infer deep level trustworthiness cues through just one positive interaction, resulting in the formation of high trust. The results of the present study clearly show that trust does not "need touch" (Handy, 1995) to develop and instead provides evidence for the notion of "swift trust" in virtual teams, adding to the extant literature in that domain (Jarvenpaa & Leidner, 1999).

Next, this research contributes by identifying factors that can directly build or destroy interpersonal trust in virtual teams. It can be seen that a single positive or negative response to a teammate's request for resources to complete a team objective can be highly influential on trust. More specifically, the positive or negative responses were written to reflect three characteristics of trustworthiness: ability, integrity, and benevolence, which should influence one's positive expectations about another person based on observed words, actions, or decisions (i.e., the definition of trust, McAllister, 1995). Trustworthiness perceptions as a predictor of trust (Mayer et al., 1995) is typically regarded as perceptions formed from deep-level cues that require time and multiple observations or experiences with the person, as opposed to surface-level cues that are easily observable, such as gender or age. Interestingly, this study shows that members of virtual teams can infer deep level trustworthiness cues very quickly and also shows that those trustworthiness cues or perceptions can influence trust levels, similar to the face to face context.

Lastly, this study examined trust over multiple time points and performance episodes because trust has been proposed as a dynamic construct and impression formation as a continual process based on the integration of accumulated information over time. This study design was advantageous over the typical short-term lab study, and allowed for observing the dynamic nature of trust. It can be seen that trust changes immediately in response to a positive or negative response received from a teammate, and further calibrates in response to subsequent

observations. In sum, this research helps clarify the nature of the interpersonal trust construct, showing that trust can establish quickly, is malleable, and easily altered especially at the formative stages of a virtual team.

Negativity Effect

Overwhelming empirical evidence has been produced for the negativity effect across a range of domains. As hypothesized, this study shows that members of a virtual team tend to place greater weight on negative information about a teammate compared to positive information of the same valence. Specifically, this result was reflected in the observer's level of trust in that teammate, where there was a significant interactive effect between the teammate's two behaviors on trust. Both a line graph of trust over time and descriptive statistics confirm that trust drops sharply after receiving negative information, while it does not increase as steeply in response to receiving positive information. In sum, this study extends extant literature on the negativity effect by showing that it occurs in the context of trust in virtual teams. More precisely, the negativity effect occurs in how people in virtual teams combine conflicting pieces of information about a teammate into one judgment of trust. With this study's finding, the negativity effect continues to be widely observed. Future research should seek to identify what boundaries exist for this effect.

Additionally, this research stresses the importance of looking at the combined influence of positive and negative behaviors from teammates. Much of organizational research is devoted to studying either positive behaviors (such as OCBs) or negative behaviors (such as CWBs) because they singularly exhibit relationships with job performance (Rotundo & Sackett, 2002; Viswesvaran & Ones, 2000). It is also important, however, to research the interaction between such behaviors of opposing valence. Organizational work is characterized by both, and workers

are often exposed to both positive and negative behaviors from coworkers or team members around them. This study shows that in the face of such conflicting information, people tend to give negative behaviors more weight when making a trust judgment about a teammate. Future research should extend this by examining dependent variables in the workplace other than trust.

Asymmetrical Expectations

As can be seen with this study, people's trust levels react more sensitively to a negative behavior than a positive behavior, but why is this so? There has been much empirical evidence for the negativity effect but little agreement on the theoretical explanations producing it. Particularly with the growth of virtual and temporary teams, organizations are looking to better understand trust and computer mediated interactions in the workplace.

This study differed from typical lab studies because it simulated interactions and delivered the manipulation at a higher fidelity than what is typically done in lab studies. Past research in the area of impression formation has largely relied on artificial lab settings removed from context and written descriptions of stimulus targets presented to subjects (Trafimow, 1994). By contrast, this study explored impression formation in a virtual team setting using a simulation of a team task and allowed participants to interact with the stimulus target. This study's design fostered a more realistic environment for researching and answering questions about the impression formation process and how it extends to trust in virtual teams.

This study found a significant interaction between Mission 1 behavior and Mission 2 behavior, indicating that the influence of the second behavior depends on the valence of the first behavior. The difference in means (35.00) between pos/neg and pos/pos conditions was larger than the difference in means (24.95) between neg/pos and neg/neg conditions. This result fits with the notion that a teammate seen initially as positive is expected to perform only positive

behaviors subsequently. When the teammate does not perform a positive behavior, a violation of that expectation occurs resulting in very low trust (and creating a large mean difference of 35). Conversely, a teammate seen initially as negative is behaviorally unrestricted; a positive second behavior does not result in much higher trust (creating a smaller mean difference of 24.95). In sum, this finding supports the notion of asymmetrical expectations of subsequent behavior based on observation of an initial behavior as implied by the hierarchically restrictive schema. Accordingly, this particular schema may be a plausible explanation for the occurrence of the negativity effect in overall attributions of trust about a teammate.

Additionally, from this research we can draw that the hierarchically restrictive schema applies to trustworthiness, generalizing beyond the traits that have been examined to date, i.e., morality, honesty, ability, and loyalty (Trafimow, 1994). It is possible to intuit which traits are hierarchically restrictive and which traits are partially restrictive, but it is currently unclear if there is some general principle dictating which traits fall under which schema. This study offers evidence that trust adheres to the hierarchically restrictive schema, that is, individuals apply the hierarchically restrictive schema to impressions for their teammate's trustworthiness.

An alternative explanation for the negativity effect should be mentioned. Namely, an order effect might have been a confound variable. Perhaps pos/neg condition was so low because the last behavior had more influence on time 3 trust than the first behavior. Counterbalancing, i.e., administering a neg/pos condition, could help rule out an order effect. However, in this study, the neg/pos condition was a manipulated level of interest, so scores from the two could not be combined into one experimental group. Perhaps if there was the same level of low trust at time 3 for this condition then we know it is not an effect of order. This was not observed in this study (neg/pos had a mean much higher than that of pos/neg), as hypothesized due to

asymmetrical expectations. Unfortunately, with this study, it is hard to disentangle whether the negativity effect is due to asymmetrical expectations or only due to the order of behaviors (i.e., receiving positive first and negative second or vice versa). Even so, trust at the within-person level does not increase in response to a positive behavior to the same extent as it decreases in response to a negative behavior, leaning in favor of the asymmetrical expectations claim.

Entitativity and Unit Formation

This study goes further to examine how schematic expectations account for the negativity effect in trust for individual targets as well as groups of individuals. No research has examined whether the negativity effect, by way of the hierarchically restrictive schema, is present when there is more than one person performing trust behaviors. This study manipulated the behavior source and found that there was no negativity effect in individuals' overall levels of trust toward a pair of teammates performing conflicting behaviors. This finding and mixed results are further explicated below.

It was hypothesized that the negativity effect would not occur when the two teammates performing the behaviors were unrelated. Indeed, a two-way interaction indicative of the negativity effect for two unrelated persons was not observed. It should be noted that retaining the null is not the same as proving the null. Nonetheless, this result is more in support of piecemeal averaging as an integration method as opposed to giving more weight to negative information.

A caveat, however, was a surprising within-person level finding visible when examining trust over repeated measurements. From Figure 10, trust in the pair of unrelated persons can be seen dropping drastically after the interjection of a negative behavior, more so than it increases after the interjection of a positive behavior. Although this finding is not as extreme as for the individual condition (i.e., trust after a negative behavior did not drop as low as it did for those

receiving the two behaviors from one individual), it is possible that at a within-person level, the negativity effect may be occurring to an extent. Also of note, a three-way interaction effect was not statistically significant, suggesting that the strength of the negativity effect, which was present in the individual behavior source condition, may not differ by the three levels of behavior source in this study: individual, unrelated pair, entity pair.

For two related persons (entity pair), this study also did not show the negativity effect in people's overall trust, contrary to what was hypothesized. It is possible that there is a true null effect, in which case, the theory that entitativity and unit formation invoke asymmetrical schematic expectations should be re-evaluated. Possibly, in the case of two unrelated persons performing behaviors, observers rely on another type of schema such as the partially restrictive schema to relate behaviors to dispositions. The partially restrictive schema posits symmetrical expectations of behavior where a second behavior that is inconsistent with the first behavior will not violate any expectations; this schema type has been shown to apply to the trait of friendliness (Trafimow, 1994). Although possible, it is unclear why this would be the case for only an entity pair and not for an individual behavior source. If the stimuli statements were construed as indicators of friendliness rather than trustworthiness, then it is possible that instead of the negativity effect, we see an averaging effect. But this is at odds with the negativity effect being present for an individual behavior source and thus is not plausible.

A null effect may also be attributable to study design or ineffective manipulation. It is possible some saw the stimuli as related to ability rather than trustworthiness. When the behaviors and disposition are related to ability, a positivity effect may occur rather than a negativity effect. This is because high ability individuals are able to perform a range of behaviors, while individuals lower in ability are restricted to only performing poorly. Thusly, in

the pos/neg condition, their expectations for the subsequent behavior were not violated. As such, their trust did not decrease sharply; it remained moderate or positive, creating large within group variability and obscuring the negativity effect. Once again, while a possible explanation for the lack of negativity here, it is at odds with the finding that the negativity effect occurs for the individual behavior source. In other words, it does not explain why this would systematically occur for trust in a pair of persons but not for an individual behavior source.

Another possibility regarding ineffective manipulation that might have contributed to the lack of a difference between groups lies in the wording of how the second person was described as a "friend and colleague." Perhaps this manipulation was not strong enough to invoke unit formation or perceived entitativity. Two people might be friends or colleagues but might not share the same values that motivate behavior. Furthermore, past research has shown that members of virtual teams tend to have lower feelings of cohesiveness (MacDonnell, O'Neill, Kline, & Hambley, 2009). Consequently, an observer might not ascribe the same expectations of behavior for the second person. Perhaps people are only expected to behave the same way when they are perceived to share deep engrained values. Furthermore, although all analyses were based on those who correctly answered the manipulation check, knowing the correct answer to a question is not qualitatively the same as believing it. If participants were skeptical of the manipulation, it is possible that they assumed a different participant, research confederate, or even an artificial intelligence chat-bot played the role of Blue in Mission 2.

Other aspects of this study may have nullified the negativity effect. For instance, a testing (fatigue) effect might have influenced participants in the unrelated and entity pair conditions. These conditions had instructions in the time 3 survey to rate their overall trust in the pair of persons. It is possible they did not read survey instructions carefully due to repeated testing,

fatigue, or carelessness because in the previous iterations of the same survey, they were instructed to rate their trust toward Blue teammate (singular). If participants did not pay careful attention to these instructions, then they would have reported their trust based on the last behavior received in Mission 2, regardless or the behavior received in Mission 1 and associated expectations for subsequent behavior.

Overall, the boundaries of the negativity effect based must be noted. Based on this study's results it appears that two conflicting pieces of information from two persons with entitativity are not differentially weighted in an overall judgement of trust in the pair of persons. For two teammates, people do not hold asymmetrical expectations of behavior. However, for an individual behavior source, the negativity effect is present. With all results collectively considered it remains difficult to unequivocally state whether behavior source has an effect on the strength of the negativity effect, or whether the negativity effect extends to making one attribution of multiple behavior sources. Although the three way interaction was not statistically significant, the significant two way interaction for individual behavior source condition in contrast to the null findings for the multiple behavior source condition might suggest that it is not only the trait that dictates what type of schema is used (hierarchical or partially restrictive), but it also depends who you are making an attribution about. Future research should investigate this further.

Limitations and Future Directions

In addition to the limitations noted above the internal validity could be improved upon by future replications of this study. Specifically, there was the possibility of confound variables affecting trust. In order to simulate a virtual team task environment, participants communicated to each other in a chatroom and collaborated with each other for a total of 1 hour in two

computer simulations. It was not possible to control for the interactions of the participants comprising the teams or what was said in the chatroom. Furthermore, several different research assistants acted as the experimenter in this study. The experimenter had a fairly prominent presence in the study because he or she not only instructed the participants at each stage of the study, but the experimenter also assisted the participants in the practice session and ensured their understanding of the mission briefings. These procedural aspects of the study created the possibility of confounds. It is possible that participants' feelings or attitudes toward the other teammates or the experimenter influenced their ratings of trust in the target.

Lastly, there may have been an effect of instrumentation. The DDD software, computer hardware, and the website used to electronically administer the surveys were sometimes unreliable. A participant's experience with the study instruments may have influenced his or her mood, trust in technology, and possibly in turn influenced their trust toward their virtual teammate(s).

Future replications of this study should improve on internal validity by measuring these variables and including them as covariates in the analyses to rule out confounds (e.g., code the content of chat communications and code for experimenter). Survey instructions should be delivered to participants in a more salient way. Future studies should follow in the same vein of using higher fidelity stimuli, and in particular make the behavior source manipulation stronger and more believable. Specifically, the behavior source manipulation should be changed from "friend and colleague" to some person who is perceived to share similar values. Given that evidence for the negativity effect continues to be widely observed, future research should be aimed at establishing boundary conditions for the negativity effect. For instance, what work-related traits, other than trust, might elicit the negativity effect and which might elicit the

positivity effect? Which traits fall under the hierarchically restrictive schema and which fall under the partially restrictive schema? Research should continue to test hypotheses that can evaluate the adequacy of the hierarchically restrictive schema as an explanation for the negativity compared to competing explanations, such as frequency weight theory (Fiske, 1980) and expectancy contrast theory (Simpson & Ostrom, 1976). Lastly, more research should delve into how people combine conflicting information from a pair of unrelated persons. If they do not weight the negative behavior more, do they simply average the two behaviors or use some other integration method?

Conclusion

This study sought to integrate and extend research across the disciplines of social and organizational psychology to answer questions about the starting levels and malleability of interpersonal trust, specifically how it changes in response to interactions among people in work teams. Guided by the schematic model of person perception, this study tested the impact of negative information on attributions, expectations, and ultimately trust. The negativity effect was found in overall ratings of trust toward a teammate in members of virtual teams. That is, observers gave more weight to a negative behavior from a teammate than a positive behavior from that same teammate. No negativity effect was found when conflicting behaviors were performed by a pair of persons, either related or unrelated. Future research should improve on internal validity and further investigate the boundaries for the negativity effect, the hierarchically restrictive schema, and how people integrate conflicting information from multiple sources.

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Appendices

Appendix A: Cognitive and Affective Based Trust

1	2	3	4	5	6	7
(Completely Disagree)	(Moderately Disagree)	(Slightly Disagree)	(Neutral)	(Slightly Agree)	(Moderately Agree)	(Completely Agree)

1. This person approaches the mission with professionalism and dedication
2. Given this person's track record, I see no reason to doubt his/her competence and preparation for our mission
3. I can rely on this person not to make my job more difficult by careless work
4. My teammates consider this person to be trustworthy
5. If people knew more about this person and his/her background, they would be more concerned and monitor his/her performance more closely **
6. This person and I have a sharing relationship. We can freely share our ideas, concerns, and strategies
7. I can talk freely to this person about difficulties I am having with the mission and know that he/she will want to listen
8. We would both feel a sense of loss if one of us was removed from the team and we could no longer work together
9. If I shared my problems with this person, I know he/she would respond constructively and caringly
10. This person and I have both made considerable emotional investments in our working relationship
11. I trust this person

** = reverse coded

Appendix B: DDD Controls Quick Guide

BASIC GAME CONTROLS

Moving

- Left click on your snowcat, right click on map

Processing a Seismic Monitor (SM)

- Left click the SM and read what it needs in Custom Attributes window
- Left click your snowcat
- Click on Subplatforms
- Left click on the resource you need (e.g., Mechanic), then right click on the map to deploy it
- Left click on the deployed resource to see its range, drive toward the SM
- When the SM is within range, left click Capabilities, left click the ability
- Right click on the SM (if it requires 3 abilities, then right click 3 times).

Docking resources

- Left click the resource
- Click on Subplatforms
- Left click Dock ability
- Right click on your snowcat

Appendix C: Mission 1 Briefing

MISSION 1 – SITUATION

- You work for NASA in the Arctic polar region.
- Yesterday a team departed home station to recover an Unmanned Aerial Vehicle (UAV) that crash landed.
- The crashed UAV contains classified materials so it must be recovered and transported back to home station.

UAV

- The team that went out yesterday encountered a severe storm and was unable to recover the UAV.
- You and the other study participants make up a 4-person Search and Rescue team. This team consists of:

Green snowcat (you)
Red snowcat
Purple snowcat
Blue home station operator

Snowcat

Appendix D: Mission 1 Instructions

MISSION 1 – OBJECTIVES

Primary Objective

- Rescue the lost party by completing Emergency Task (ET-1)
  - Instructions: At 3:20 drive your snowcat to ET-1. Station Blue has resources for this task that can be given to you. Request "1 set of resources" from your teammate Blue Station Operator and observe his/her response. You get the most points for using the resources given to you by Blue for ET-1 and not your own resources. Work as a team to process ET-1.
  - Team composition: You are Green snowcat. You have 2 other teammates operating Red and Purple snowcats. The 4th member of your team operates Station Blue.
  - Rules: Communication to Blue only works for requesting ET-1 resources. Once ET-1 has been processed Blue can no longer see chatroom requests. You have 15 minutes to complete this objective (end time: 18:20) .

Secondary Objective

- Recover the crashed UAV
  - Instructions: Find the unmanned aerial vehicle (UAV).
  - Additional information: You can use any of your own resources to process the following objects. Once processed, the icon may or may not provide you with helpful information. Your team also scores points when you process the these icons.
    - Seismic monitors (worth 10-80 points)
    - Medical tasks (worth 50 points)
    - Repair tasks (worth 50 points)
  - You have until the end of the mission (30:00).

Appendix E: Mission 2 Briefing for Individual Condition

MISSION 2 – SITUATION

- You work for NASA in the Arctic polar region.
- Yesterday a team departed home station to scout the location of a Gondola (aerial cable car) that came off its cable due to severe weather.
- The Gondola must be found and re-attached to the cable so that deliveries across a large crevasse can be made.

Gondola

- The team that went out yesterday encountered a severe storm and was unable to recover the Gondola.
- You and the other study participants make up a 4-person Search and Rescue team. This team consists of:

Green snowcat (you)
Red snowcat
Purple snowcat
Blue home station operator

Snowcat

Appendix F: Mission 2 Briefing for Unrelated Condition

MISSION 2 – SITUATION

- You work for NASA in the Arctic polar region.
- Yesterday a team departed home station to scout the location of a Gondola (aerial cable car) that came off its cable due to severe weather.
- The Gondola must be found and re-attached to the cable so that deliveries across a large crevasse can be made.

Gondola

- The team that went out yesterday encountered a severe storm and was unable to recover the Gondola.
- You and the other study participants make up a 4-person Search and Rescue team. This team consists of:

Green snowcat (you)
Red snowcat
Purple snowcat
Blue home station operator

Snowcat

- Before you depart, the operator at Blue Station who worked as your teammate in Mission 1 has left and been replaced by another operator (i.e., by another study participant). Your new teammate is not related to nor associated with Blue Operator from the 1st mission. They have <u>not</u> spent any time together. This person will now join your team as Blue Station Operator.

Appendix G: Mission 2 Briefing for Entity Condition

MISSION 2 – SITUATION

- You work for NASA in the Arctic polar region.
- Yesterday a team departed home station to scout the location of a Gondola (aerial cable car) that came off its cable due to severe weather.
- The Gondola must be found and re-attached to the cable so that deliveries across a large crevasse can be made.

Gondola

- The team that went out yesterday encountered a severe storm and was unable to recover the Gondola.
- You and the other study participants make up a 4-person Search and Rescue team. This team consists of:

Green snowcat (you)
Red snowcat
Purple snowcat
Blue home station operator

Snowcat

- Before you depart, the operator at Blue Station who worked as your teammate in Mission 1 has left and been replaced by another operator (i.e., by another study participant). Your new teammate is a close friend and colleague of Blue Operator from the 1st mission. They have spent a lot of time together and are very similar.

Appendix H: Mission 2 Instructions

MISSION 2 – OBJECTIVES

Primary Objective

- Rescue the lost party by completing Emergency Task (ET-1)
  - Instructions: At 3:20 drive your snowcat to ET-1. Station Blue has resources for this task that can be given to you. Request "1 set of resources" from your teammate Blue Station Operator and observe his/her response. You get the most points for using the resources given to you by Blue for ET-1 and not your own resources. Work as a team to process ET-1.
  - Team composition: You are Green snowcat. You have 2 other teammates operating Red and Purple snowcats. The 4th member of your team operates Station Blue.
  - Rules: Communication to Blue only works for requesting ET-1 resources. Once ET-1 has been processed Blue can no longer see chatroom requests. You have 15 minutes to complete this objective (end time: 18:20) .

Secondary Objective

- Recover the fallen Gondola
  - Instructions: Find the unmanned aerial vehicle (UAV).
  - Additional information: You can use any of your own resources to process the following objects. Once processed, the icon may or may not provide you with helpful information. Your team also scores points when you process the these icons.
    - Seismic monitors (worth 10-80 points)
    - Medical tasks (worth 50 points)
    - Repair tasks (worth 50 points)
  - You have until the end of the mission (30:00).

Appendix I: IRB Approval

UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

March 28, 2014

Tiffany Lee
Psychology
Tampa, FL 33647

RE: **Expedited Approval for Initial Review**
IRB#: Pro00016611
Title: Impression Formation and Trust Development in Virtual Teams

Study Approval Period: 3/27/2014 to 3/27/2015

Dear Ms. Lee:

On 3/27/2014, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents outlined below.

Approved Item(s):
Protocol Document(s):
Thesis

Consent/Assent Document(s)*:
Informed Consent.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board