

FEELING CLOSER BUT FURTHER APART? MEDIA MODALITY'S EFFECTS ON  
UNCERTAINTY PERCEPTION IN ROMANTIC RELATIONSHIPS

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## **ABSTRACT**

For decades Communication scholars theorized how uncertainty will influence various communication phenomena. The present study seeks to differentiate personal, interpersonal, and transactional uncertainty under the Uncertainty Reduction framework. The study finds that there is a qualitative difference between a personal vs. interpersonal uncertainty in close relationship, and these uncertainties varies as function of communication channels. A new set of measures of uncertainties in close relationship is established, showing casing excellent convergent, discriminate, and predictive validity and internal consistency.

This thesis is dedicated to my beloved advisor Brandon, and my wonderful committee members Sandi and Dave. Thank you all so much for always believing in me. It is my absolute honor to have all of you to be part of my academic journey.

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## INTRODUCTION

When making a decision, interacting with a loved one, or planning an event, humans experience uncertainty. Mathematically, uncertainty refers to the error terms in estimating a parameter or its variability from a true state. It is one of the fundamental reasons that make humans hard to predict. Over the years, multiple disciplines have attempted to address questions of uncertainty in human experience, such as explicating its forms and influence on human decision-making, enumerating contextual factors that influence its potency, and even developing mathematical models to quantify its existence in human psychology. Communication scholars have been fascinated by the concept of uncertainty since the 1970s and have taken a keen interest in its forms, exploring various communicative behaviors that reduce or amplify its experience (Brashers, 2007). Communication is a dynamic process that requires interaction between two or more individuals. Uncertainty fluctuates and changes during a conversation (Afifi & Burgoon, 2000), suggesting that it is both interactive and time dependent. However, few communication studies have delved into interactive and dynamic dimensions of uncertainty, with much attention only paid to global assessments of uncertainty, such as relational and personal (Afifi & Weiner, 2004; Berger & Calabrese, 1975; Knobloch & Solomon, 1999). Thus, the goal of the present study is to explicate the temporal and interactive nature of uncertainty during the communicative process. This paper will first explicate various forms of uncertainty and their definitions. Then, specific hypotheses are outlined based on theoretical relationship. A survey experiment was conducted to establish a new set of uncertainty measures and test various hypothesized relationships. Lastly, the results and implications for the study is highlighted at the end.

## **Uncertainty Reduction Theory (URT)**

In the communication literature, there are more than seven well-studied and developed theoretical perspectives for theorizing uncertainty under numerous communication contexts, such as Uncertainty Reduction Theory (URT) (Berger & Calabrese, 1975), Anxiety/Uncertainty Management (Gudykunst, 1995), theories of Uncertainty Management (Brashers, 2007), and Predicted Outcome Value Theory (Sunnafrank, 1986), to name just a few. Including literature outside of communication reveals even more sibling constructs, such as uncertainty orientation (Sorrentino et al., 1995), need for closure (Kruglanski et al., 2006), and equivocality (Weick, 1979). Perhaps the most influential work in communication studies on uncertainty is URT by Berger and Calabrese (1975).

In their original work on URT, Berger and Calabrese defined uncertainty along two theoretical dimensions: proactive and retroactive. Proactive focuses on an individual's ability to predict their partner's future behaviors, while retroactive focuses on people's ability to make sense of and explain a communicating partner's past behaviors. Feelings of uncertainty arise from the lack of information people have about the interacting individuals (Berger & Calabrese, 1975). In further developments of URT, Berger and colleagues divided uncertainty into cognitive uncertainty and behavioral uncertainty in an effort to specify the contents of various kinds of uncertainties (Berger, 1979; Berger & Bradac, 1982). Cognitive uncertainty arises when individuals lack clear perceptions of their own and others' beliefs and attitudes in a relationship. Behavioral uncertainty refers to an individual's lack of ability to predict others' behaviors and attitudes in particular circumstances. These modifications were added to account for the influences of norms and interaction rituals. For example, when an individual interviews for a job, certain actions are expected, such as being asked about job experience, thereby making the

situation lower in behavioral uncertainty. However, an individual may still possess high levels of cognitive uncertainty if they lack information about their interacting partner's beliefs and attitudes. At other times, both cognitive and behavioral uncertainty may be high, such as meeting someone in a place the individual has never been before.

### **Interpersonal Uncertainty**

More recently, Walther (2019) raised issues with the original conceptualization of uncertainty, making a more precise distinction between personal and interpersonal impressions. In his writings, personal impressions or information refer to mental models we hold about a unique individual that differ from those about other people. As proposed by the Uncertainty Reduction Theory (URT) framework, individuals can reduce uncertainty or gain information about another individual by using three different types of strategies: active strategies, where the individual directly observes the target; passive strategies, where the individual observes the target indirectly; and interactive strategies, where the individual interacts with the target directly.

Although an individual may be capable of reducing various kinds of behavioral and cognitive uncertainty through observation, asking others, and reliance on norms and interactional rituals, one's information or impression of another individual does not become interpersonal until the individual interacts with the target directly (Walther, 2019). In other words, an interpersonal impression or knowledge is idiosyncratic to a particular dyad. Taking the previous example, while an individual may decrease their uncertainty of the interviewer by relying on interactional rituals and observation of how the target interacts with other interviewees, one still lacks the idiosyncratic knowledge of how the interviewer will interact with themselves specifically. Interpersonal uncertainty arises from uncertainties about how a target individual will respond to oneself. Interpersonal uncertainty is particularly important in established relationship where the

communication dyads have unique knowledge of their relational partner. Any variability in the interpersonal uncertainty could directly mediated relational outcomes, such as trust and relational satisfaction where the relational dyads feel uncertain how relational partner will react towards themselves. Interpersonal uncertainty may be particularly important in established relationship where the communication dyads have unique knowledge of their relational partner. Any variability in the interpersonal uncertainty could directly mediated relational outcomes, such as trust and relational satisfaction where the relational dyads feel uncertain how relational partner will react towards themselves.

Walther's (2019) distinction between personal and interpersonal impressions is not unprecedented. Knobloch & Solomon (1999, 2002) made a similar distinction between self, partner, and relational uncertainty. In contrast to the majority of work on URT, which focuses on initial interactions, Knobloch & Solomon (1999, 2002) were more concerned with the role of uncertainty beyond initial interactions and further conceptualized Berger & Bradac's (1982) work on uncertainty in interpersonal communication. It was theorized and validated that questions, doubts, and ambiguities about one's relationship involvement are present in all close relationships. In contrast with an individual's lack of ability to predict or explain a target's attitudes, emotions, and behaviors, relational uncertainty arises from the relationship itself and is unique to a particular dyad. Self-uncertainty pertains to the individual's doubts regarding their own role and involvement in the relationship, while partner uncertainty addresses concerns one may have about their partner's engagement and commitment. Relationship uncertainty, on the other hand, refers to the overall uncertainties regarding the nature and future of the relationship itself (Knobloch & Solomon, 1999, 2002). Self and partner uncertainties are considered lower-order constructs of relationship uncertainty. Although arising differently in the literature, both



Walther (2019) and Knobloch & Solomon (1999, 2002) emphasize the unique level of uncertainty that is specific to a particular dyad. This is not to equate the two constructs of uncertainty, as they are distinct. Relational uncertainty is focused on an individual's view of the interpersonal relationship itself, while interpersonal uncertainty concerns one's unique perceptions and knowledge of the target.

The question remains: how does one capture the additional variance, if any, that interpersonal uncertainty may explain in addition to personal uncertainty? One of the most widely used measures of uncertainty, CLUES-7 (Clatterbuck, 1979), already contains one item that assesses the unique dyadic knowledge of an individual to the target (e.g., "How certain are you that he/she likes you?"). In contrast with the other four items, which capture more personal rather than interpersonal uncertainty (e.g., "How confident are you of your general ability to predict how he/she will behave?"). To increase the reliability and validity of the current measures, the present study seeks to develop a new set of measures factor design to capture the various types of uncertainties.

### **Uncertainty and Information Environment**

Uncertainty is a self-perception where individuals perceive that details about the interacting individual are unavailable or inconsistent. It is one's own cognitive state in which the individual feels insecurity and is negatively aroused by their lack of knowledge of the interacting party (Brasher, 2001; Berger & Calabrese, 1975; Gudykunst, 1995). Uncertainty is a cognitive state that resides in individual perceptions, but uncertainty reduction is a process in which this cognitive state changes as individuals interact with the target. In this process, an individual is inevitably influenced not only by the target but also by the information environment. Here, the information environment is defined as the channel through which the interaction occurs. The

information environment in which uncertainty reduction unfolds will predetermine the types of cues or information sources that individuals have to rely on when reducing their uncertainty with another party. The type of cues that are afforded in the information environment will not only determine the rate at which uncertainty reduction can unfold (Walther, 1992) but should also shape the perceived amount of uncertainty in a given interaction. To put it simply, if two men are tasked with digging a hole in the ground and one is given a spoon while the other a shovel, the relative size of the hole to the individual would differ. The same could be said for uncertainty: when the information environment limits the types of cues that can be utilized to fill in the hole of uncertainty, cues that carry more weight should reduce individuals' perceptions of the uncertainty level. Therefore, the present study seeks to advance the idea of transactional uncertainty. Transactional uncertainty is people's confidence in deciphering the information cues in a given communication environment. It is the degree of negative arousal that individuals feel towards the target and the messages at a given moment in time in a given communication environment. It captures the discrepancies in uncertainty perception with respect to different information environments.

One breakthrough in exploring the role of time in interpersonal communication comes from studies in Computer-Mediated Communication (CMC). It was theorized and validated that, given enough time, people can establish comparable levels of interpersonal impressions and reduce uncertainty using text-based messages alone (Walther, 1992; Tidwell & Walther, 2002). Later research further supported these arguments by introducing cues interchangeability, where individuals can sense relational-level information, often derived from non-verbal cues, from text messages as well, albeit it takes longer and more effort (Siegel et al., 1986; Walther et al., 2005). The discrepancy in how long it takes for relational information to transfer between CMC and FtF

is a direct result of limited access to non-verbal cues. Non-verbal cues carry information.

Decades of research on non-verbal cues in psychological research have pointed to the role of non-verbal cues in carrying relational information in social interaction, and in various instances, non-verbal cues carry more weight or trump verbal cues (see Burgoon & Le Poire, 1999; Hall et al., 1978; Argyle et al., 1970; 1972).

If non-verbal cues carry more important interpersonal information, such as intimacy (Burgoon & Le Poire, 1999) and interpersonal attitudes (Argyle et al., 1970), it is also the case that non-verbal cues satisfy individual uncertainty arousal. These discrepancies in available sources of information may be particularly salient at the micro-transitional level. As demonstrated in the series of studies on Social Information Processing theory, by modifying the number of sources of available information (e.g., non-verbal cues), the time it takes for people to satisfy their uncertainty towards another individual also varies (see Walther, 1992; Tidwell & Walther, 2002). By extension, people's perception of uncertainty should vary by medium as a function of the amount of verbal and non-verbal cues the medium carries at the transactional level.

The more sources of information people have access to, the quicker uncertainty can be decreased. The discrepancy in the number of available sources of information should translate to different perceptions of uncertainty when communicating FtF versus via mediated channels. More specifically, it is hypothesized that people should have lower uncertainty perception when communicating FtF than CMC. For example, a message sent through text carries less weight than an identical message paired with non-verbals. To compensate for the discrepancy, it takes longer and demands more effort for people to satisfy uncertainty through messages alone. To be clear, the difference between transactional uncertainty (personal/interpersonal) and personal and

interpersonal uncertainties is not particularly situational but perceptual. First, the perceptual differences lie in the availability and type of information source (e.g., What cues are available when communicating in different environments?), which in turn guides individuals' uncertainty judgments. Some evidence can be found in modality switch (see Ramirez & Zhang, 2007) and the Hyperpersonal model (Walther, 1996) literature, a special case of SIP.

In modality switch and the hyperpersonal model literature, impressions people form online do not often coincide with reality. Perceptions people form online tend to be hyperbolized, either positively (Ramirez & Zhang, 2007; Walther, 1996) or negatively. It is theorized that due to limited access to non-verbals information, people over-attribute based on a limited number of information sources (in this case, it was text only), thus forming impressions that are inconsistent with reality. Underlying these results, these studies may actually be pointing out different uncertainty perceptions with respect to different sources of information and uncertainty assessment. Verbal and non-verbal cues formulate distinct perceptions of uncertainty with varying weights in the uncertainty reduction process. This perceptual difference can also be inferred from studies in psychology comparing the influence of verbal and non-verbal cues (Argyle et al., 1970), where non-verbal information can either triumph, compensate for, or replace verbal information.

Second, the communicating environment should bias the initial assessment of the uncertainty level. For example, the lack of available information sources with lower weight should heighten the perception of uncertainty. As Walther (2019) pointed out, the inclusion of non-verbal information, such as images, does not necessarily give individuals more information about the target. However, when we limit the types of information available in a communication setting, individuals will formulate a distinct assessment of the uncertainty level. This could have

a profound impact on how individuals assess uncertainty. The absent of important non-verbal information restricts sources in which uncertainty can be reduced. This in turn should increase the sense of anxiety or negative arousal people experience with interacting with a target.

Lastly, transactional uncertainty is to be distinguished from both personal and interpersonal uncertainty. Both interpersonal and personal are more global judgments of the target individual, while transactional uncertainty is not. In contrast to URT's cognitive uncertainty and behavioral uncertainty, where evaluation falls primarily on the target, the content of transactional uncertainty should fall on the message perception. Transactional uncertainty seeks to specifically explain the variance captured by the type of information source at an interaction level. This message perception uncertainty is directly influenced by the type of information cues utilized in the information environment. The discrepancy in the types of information sources shapes individuals' efficacy beliefs (Bandura, 1997) in their ability to satisfy uncertainty arousal.

### **Uncertainty and Communication Quality**

A new construct lacking predictive power is akin to a knife without an edge. By accounting for uncertainty arising from the information environment, transactional uncertainty should explain variance above and beyond both personal and interpersonal uncertainty. One of the most obvious ways to test this assumption is to examine whether transactional uncertainty can predict communication outcome variables, such as the quality of a communication interaction. Lower transactional uncertainty should predict higher quality of communication perceptions, as individuals experience lower levels of arousal towards communicative interactions (Gudykunst, 1995). Conversely, higher transactional uncertainty appraisals should diminish individuals' perceptions of communication quality. In other words, the availability of

different information cues in a communication environment is theorized to shape individuals' perceptions of uncertainty levels, as they rely on these cues to satisfy their uncertainty needs. In a semantic analysis of intergroup communication over time, Guerrero & Gudykunst (1996) found that "The majority of respondents alluded to non-verbal communication as the prime indicator of successful communication" (p. 65). Therefore, by comparing transactional uncertainty in different information environments, it is expected that people will perceive different transactional uncertainty levels with different information environments. This transactional uncertainty should, in turn, influence perceptions of the quality of communication within that information environment. Thus, the following hypotheses are proposed:

H1: There is a positive relationship between (a) interpersonal transactional uncertainty and (b) personal transactional uncertainty on perceived communication quality in both text and face-to-face (FtF) conversations.

H2: Individuals will perceive higher (a) interpersonal transactional uncertainty and (b) personal transactional uncertainty in text communication than in FtF communication.

H3: Perceived Communication quality will be higher in FtF communication than Texting communication.

### **Relationship and Uncertainty**

One of the most fundamental functions that URT explains is how individuals develop relationships and formulate impressions. However, the majority of research inspired by URT has focused on zero-history dyads. Later research on relational uncertainty (for a review, see Knobloch & Solomon, 2002) extended URT into established relationships. It has been found that the presence of relational uncertainty is correlated with decreased liking (Gudykunst, 1985), feelings of jealousy (Knobloch et al., 2001), and a variety of other negative relational outcomes

(Sorrentino et al. 1995). In contrast to URT, research on uncertainty management and relational uncertainty argues that individuals do not always seek to reduce uncertainty. In fact, relational uncertainty has been found to be associated with both relational excitement and love (Baxter & Montgomery, 1996).

More recently, there has been growing scholarship using both Social Information Processing Theory and the Hyperpersonal Model to explain the communicative process in established romantic relationships (Hampton et al., 2017; Holtzman, 2021; Jiang & Hancock, 2013; Toma & Choi, 2016; Brody, 2013). Some of these researchers argue that since romantic couples rely on mediated communication channels to engage in relationship maintenance behaviors, communication between established romantic relationships will also be subject to the intensification process as described in the hyperpersonal model. Other research claims that since relational information takes longer and more effort to transmit through mediated forms of communication, there will be an increasing amount of uncertainty buildup (Jiang & Hancock, 2013). Thus, the following hypotheses are raised:

Much of the literature on interpersonal computer-mediated communication comes from studies on Long-Distance Romantic Relationships (LDRRs) (Brody, 2013; Hampton et al., 2017; Holtzman, 2021; Stafford & Merolla, 2007; Jiang & Hancock, 2013), as LDR couples usually have an established relationship status before being separated and heavily rely on various media channels for communication when separated. This creates an ideal situation for researchers to observe the effects of mediated communication on interpersonal relationships. It is widely theorized that once romantic partners become geographically separated, uncertainty is created (Stafford & Merolla, 2007; Jiang & Hancock, 2013). When romantic couples become geographically separated, they have lower access to their partner's interpersonal repertoire

(Schulman, 1974; Miller et al., 2003). The lack of exposure to mundane experiences weakens individuals' confidence and ability to predict what their relational partner thinks, feels, and behaves. By extension, individuals are likely to grow less confident in their ability to predict how their partner will react towards themselves, increasing interpersonal uncertainty. Transactional uncertainty should be particularly pronounced in LDRRs when communicating through media that afford a lower amount of non-verbal cues. In these instances, individuals are not only faced with an interaction where they know less about the target but also have to rely on a medium that is less efficient than others. Thus, the following hypotheses are raised:

H4: LDRRs will perceive higher (a) personal uncertainty, (b) interpersonal uncertainty, and (c) transactional personal/interpersonal uncertainty in both FtF and texting than geographically close romantic relationship (GRR) couples.

It is generally believed that as a relationship develops, uncertainty decreases (Berger & Calabrese, 1975). The more individuals observe, interact with, and connect to a target's social circles, the fewer questions they will have and the more confident they will be in how the target will behave and feel in various situations. This is also true for both transactional and interpersonal uncertainty. The more interactions individuals have with the target, the more they can learn how their partner reacts to their feelings and behaviors (Bandura, 1986), decreasing their interpersonal uncertainty. Transactional uncertainty functions similarly to other types of uncertainty. For example, research on channel expansion theory (Carlson & Zmud, 1999) emphasizes the importance of individual experience with a particular medium and the communicating partner in directly shaping media richness perceptions. The more familiar an individual is with utilizing a particular medium and the communicating partner, the higher their ability to encode and decode the meaning of the target messages, leading to more efficient



communication and a higher perceived social presence (Carlson & Zmud, 1999; D'Urso & Rains, 2008). By extension, as the relationship progresses and interaction through a variety of mediated and unmediated communication channels increases, the relative weight discrepancy between verbal and non-verbal cues in satisfying uncertainty should diminish. People should grow more comfortable and efficient in communicating with their partner through media channels that afford a lower amount of non-verbal cues, decreasing the level of uncertainty due to the communication medium. Thus, as the relationship progresses, transactional uncertainty should decrease. Therefore, the following hypotheses are raised:

H5: As the relationship progresses, (a) personal uncertainty, (b) interpersonal uncertainty, and (c) transactional personal/interpersonal uncertainty in both FtF and texting decrease.

## METHOD

### Procedure

An online study was conducted using Qualtrics, where eligible participants were recruited from a university website. Participants' identities were secured with two-factor authentication and an associated ID number. The study received approval from the Institutional Review Board of the principal investigator's university. All identifying information was removed immediately after data collection. Initially, participants answered a set of questionnaires measuring personal and interpersonal uncertainties about their romantic partners. Subsequently, they completed questionnaires on their perceived transactional uncertainties (personal and interpersonal) through texting and face-to-face conversation. The order of the three sets of uncertainty measures was randomly assigned to each individual. Participants were then randomly assigned to recall their communication quality on a 10 points semantic differential scale (Duck et al., 1991) with their romantic partner via face-to-face (FtF) and texting. The order of these two measures was counterbalanced. Finally, participants answered a set of general demographic questions, including their relationship length, relationship type (GCRR or LDRR), age, and sexual orientation. The final dataset contained 179 participants, aged 17 to 34, with 143 female participants, an average relationship length of 18.4 months, and 52 self-identified as in long-distance romantic relationships (LDRR).

Results:

### Measures Development

To expand and validate current measures on uncertainty, Clatterbuck's (1979) measures on attributional confidence were first segmented into personal and interpersonal parts. The item "How certain are you that he/she likes you?" was categorized as interpersonal, while the

remaining four items (e.g., "How confident are you of your general ability to predict how he/she will behave? How accurate are you at predicting the values he/she holds") were categorized as personal uncertainty measures. Using this separation as a guide, a new set of personal and interpersonal uncertainty measures was developed using a 100-point scale (see Table 1 & 2). To develop transactional uncertainty measures, the interpersonal and personal uncertainty measures were used as benchmarks. The measures were also segmented into personal transactional uncertainty and interpersonal transactional uncertainty (see Table 3 & 4). As attributional confidence is theorized as reliable and valid measures of certainty, to all values are reversed coded to reflect the nature of this scale to measure uncertainty present (Clatterbuck's, 1979).

## RESULTS

### Reliability and Validity Assessments

To assess the reliability and validity of the measures, a first-order confirmatory factor analysis (CFA) was conducted using JASP version 0.18.3. To assess the sampling adequacy of the CFA model, a Kaiser-Meyer-Olkin (KMO) test (0.94) and Bartlett's test of sphericity ( $\chi^2=2919.9$ ,  $df=153$ ,  $p<.001$ ) were conducted, indicating excellent sampling adequacy and that the correlation matrix was not an identity matrix (Kaiser, 1974). To assess the correlation between individual indicators and the latent variables, loadings were computed, with all factor loadings above 0.7, indicating high validity of an indicator to the latent variable (Hair et al., 2010). To assess convergent validity of the latent constructs, Average Variance Extracted (AVE) tests were performed, with Interpersonal at 0.61, Personal at 0.70, transactional interpersonal at 0.80, and transactional personal at 0.80 (greater than 0.7 is excellent, whereas greater than 0.5 is acceptable; Fornell & Larcker, 1981). To assess discriminant validity, the Heterotrait-Monotrait ratio of the correlations was performed, and the resulting matrix values (see Table 5) were all below the 0.85 threshold (Henseler et al., 2015). To assess the reliability of the measures, Cronbach's Alpha was tested, with all individual factors and overall reliability above 0.85 (see Table 4). Lastly, to assess model fit, the following goodness-of-fit indices were used: the Comparative Fit Index (CFI) at 0.96, and Root Mean Square Error of Approximation (RMSEA) at 0.07 (RMSEA: less than .08 is acceptable, less than .05 is excellent), and Standardized Root Mean Square Residual (SRMR) at 0.046 (Hu & Bentler, 1999). In summary, the developed measures achieved good model fit and passed both reliability and validity assessments.

For Hypothesis 1, two multiple regression analyses were used to test if (a) interpersonal transactional uncertainty and (b) personal transactional uncertainty predict perceived

communication quality in both text and FtF conversations. The first multiple regression analysis, focusing on text communication, indicated that the two predictors explained 34.7% of the variance (Adjusted  $R^2 = .347$ ,  $F(2,177) = 47.12$ ,  $p < .01$ ). It was found that transactional interpersonal uncertainty significantly predicted perceived text communication quality ( $\beta = 0.012$ ,  $p < .01$ ), as did transactional personal uncertainty ( $\beta = .010$ ,  $p < .01$ ), supporting Hypothesis 1(a). A second multiple regression analysis tested if interpersonal and personal transactional uncertainty predicts perceived communication quality in FtF conversations. The results indicated that the two predictors explained 22.1% of the variance (Adjusted  $R^2 = .221$ ,  $F(2,177) = 26.4$ ,  $p < .01$ ). Interpersonal transactional uncertainty significantly predicted perceived FtF communication quality ( $\beta = .016$ ,  $p < .01$ ), but not personal transactional uncertainty ( $\beta = 0$ ,  $p > .05$ ), partially supporting Hypothesis 1(b).

To test for Hypothesis 2, two paired samples T-tests were conducted. For interpersonal transactional uncertainty, perceived interpersonal transactional uncertainty was significantly higher in texting communication ( $M = 69.88$ ,  $SD = 18.71$ ) than FtF communication ( $M = 82.28$ ,  $SD = 12.52$ );  $t(179) = 10.54$ ,  $p < .01$ . For personal transactional uncertainty, perceived interpersonal transactional uncertainty was significantly higher in texting communication ( $M = 71.95$ ,  $SD = 16.84$ ) than FtF communication ( $M = 84.84$ ,  $SD = 10.93$ );  $t(179) = 10.85$ ,  $p < .01$ , supporting Hypothesis 2.

To test for hypothesis 3, a paired samples T-tests were conducted. As expected, perceived communication quality for FtF ( $M=4.01$   $SD = 0.034$ ) were significantly higher than texting communication ( $M=3.5$   $SD = 0.046$ );  $t(179)=11.42$ ,  $p<0.01$ , supporting hypothesis 3.

To test for Hypothesis 4, a MANOVA were conducted using relationship types as independent variable, and six types of uncertainty as dependent variables, which includes,

interpersonal, personal, transactional personal (FtF/Text), transactional interpersonal (FtF/Text). Findings revealed a nonsignificant associations between the relationship types and the six types of uncertainties;  $F(1, 178)=0.102, p>0.05$ .

To test for Hypothesis 5, a multivariate regression were conducted. As expected, The regression model for Interpersonal uncertainty revealed a significant effect of relationship length, with a coefficient of 0.214,  $t(177) = 3.785, p < .001$ , explaining 7.49% of the variance (Adjusted  $R^2 = .06967$ ). As did personal uncertainty with a coefficient of 0.216,  $t(177) = 4.123, p < .001$ , with an explained variance of 8.25% (Adjusted  $R^2 = .08248$ ), transactional personal (Texting) with a coefficient of 0.313,  $t(177) = 3.822, p < .001$ , with the model explaining 7.13% of the variance (Adjusted  $R^2 = .07103$ ), transactional interpersonal (Texting) with a coefficient of 0.280,  $t(177) = 3.146, p = .002$ , accounting for 4.76% of the variance (Adjusted  $R^2 = .04761$ ), transactional personal (FtF) with a coefficient of 0.200,  $t(177) = 3.654, p < .001$ , explaining 6.49% of the variance (Adjusted  $R^2 = .06490$ ), and transactional interpersonal (FtF) a coefficient of 0.171,  $t(177) = 2.780, p = .006$ , with an explained variance of 3.64% (Adjusted  $R^2 = .03643$ ), supporting all of H5.

## DISCUSSION

The information environment shapes our perception of uncertainty in interactions with targets. Uncertainty reduction is a process where increased information leads to reduced uncertainty. However, it is the type of information source that not only determine the rate in which uncertainty reduction occurs, but also the amount of uncertainty that individuals perceive. This study established a new set of measures for uncertainty reduction, specifically interpersonal and transactional uncertainty, and demonstrated their validity, reliability, and predictive power in both mediated and FtF communication.

Initially, existing uncertainty measures guided the creation of updated measures for personal and interpersonal uncertainty, laying the groundwork for transactional uncertainty measurements. A first order CFA was conducted, which demonstrated excellent model fits, factor loading, validity, and reliability. In evaluation of its predictive power, a series of regression were conducted with communication quality and relationship length measures, demonstrating good predictive power.

As expected, there is a positive relationship between interpersonal transactional uncertainty and personal transactional uncertainty on perceived communication quality in both text and face-to-face conversations. Due to cue discrepancies, individuals perceive higher interpersonal transactional uncertainty and personal transactional uncertainty in text communication than in FtF communication. Higher uncertainty perceptions lead to biased perceptions of information of the information environment, undermining the perceived quality of texting over FtF communication.

When controlling for the effects of interpersonal transactional uncertainty, personal transactional uncertainty became an insignificant predictor in FtF communication, while both

remained significant predictors of communication quality in texting communication. To further understand this relationship, two multiple regressions were conducted for FtF and texting communication with personal, interpersonal, and transactional personal/interpersonal variables. The results suggest that across both conditions, interpersonal transactional uncertainty was the best and most significant predictor of communication quality (see Table 6 & 7). This makes sense as transactional interpersonal uncertainty takes into account both the uniqueness of the relational dyads at interpersonal level and modality effects when measuring uncertainty. Personal and general or transactional uncertainties are likely encompassed by the measure of transactional interpersonal uncertainty.

No uncertainty discrepancy seems to emerge by comparing LDRR and GCRR. This finding was not particularly surprising as previous studies found mixed support this hypothesis (See Stafford et al., 2006; Stafford & Merolla, 2007; Jiang & Hancock, 2013). One of the significant hallmarks of LDRR is idealization. It was theorized that when relational couples become geographically separated, uncertainties are induced (Stafford & Merolla, 2007; Jiang & Hancock, 2013). However, as relational partners generally want to preserve their romantic relationships, couples engage in idealization to ward off uncertainties. The push and pull results in a tug of war between uncertainty and idealization. Future studies should test these assumptions by using dyadic data analysis techniques to demonstrate these theorizations.

Different modalities play a significant role in shaping our uncertainty perceptions. Individuals are less confident interpreting feelings, emotions, and attitudes of the interacting target in information environments where cues are restricted. This is an important extension to both URT and SIP theory. First, different media environments that afford varying amounts of non-verbal cues play a significant role in shaping uncertainty perceptions. When communicating



through mediated channels, uncertainty is perceived to be higher than in FtF conversations, significantly impacting the perceived communication quality in relational dyads. Higher transactional uncertainty is associated with lower perceived communication quality. There has been much debate on the validity of SIP, particularly in survey studies. People consistently report lower perceived communication quality in survey studies, while pre/post-test design experiments fail to support these findings. The discrepancy in transactional uncertainty between FtF vs. texting communication highlights that people may be influenced by their perceptions of media environments, not their actual experiences with their communicating partner. This is particularly evident in the post-hoc analysis, where controlling for relationship length, interpersonal transactional uncertainty remained a significant predictor of perceived communication quality.

A important distinction must be made in accessing uncertainty perception in communication. The present study concurs with Brashers's definition of uncertainty with a particular emphasis on perceptions aspects of uncertainty. However, there is much a discrepancy between people perceptions of uncertainty and the actual uncertainty people experience. This apparent discrepancy have struggled CMC scholars for decades. When forcing individuals to communicate via lean cues modality, participants always express a desire to "see the other in person" as if seeing the other individual reveal more information of the interacting parties when indeed all information of the interacting party have been achieved via mediated communication. Perhaps, the people are just hard wired to prefers unmediated over mediated communication. From touch to smile, from social distance to vocalics, psychologist have long demonstrated the influence of non-verbal communication in human development (Bates, 1976; Buck, 1975; Harlow, 1958). The perceived discrepancy between mediated vs. FtF communication is fact so what a byproduct of machine heuristics (Sundar, 2008) in combination with an illusional reliance

of non-verbal cues in gaining interpersonal knowledge. This is not to undermine the role of individual perceptions in communicative exchanges, as these fundamental discrepancy inevitable influence how we evaluate the communicative exchanges. Perhaps, one can even argued that it is ultimately that individual perceptions that guide our behaviors, and that the actual uncertainty between communicating individual is inferior to the other. But it will do us no good when ignoring these fundamental misconceptions and simply conceptualized mediated communication as inferior as cues filtered out perspectives.

The clear distinction between interpersonal and personal uncertainty marks an important diversion from the previous literatures on URT. For decades, URT was talked about as part of the larger impression formation literature where individual formulate some impression of the target. As Nalini Ambady and Robert Rosenthal (1993) have famously demonstrated in a matter of seconds, individuals could formulate a unique impression of the target on a wide range of characteristics. If research were to run the study again and asking them “How accurate are you at predicting the values your teachers hold about you?”, it is unlikely these participants would be particularly confident in their answer. Communication is a fundamentally a mutual and contingent process. Interpersonal uncertainty is one manifestation of communication unique characteristics.

In a world where various modalities of mediated communication become more ubiquitous, the URT reduction process should reflect these changes and consider how uncertainty reduction may occur differently across various communication channels. The newly established measure offers researchers an additional tool with which they can tap into the dynamic process in interpersonal computer-mediated communication (CMC). For many years, CMC scholars have relied on measures that do not take into account elements of mediated

communication and heavily rely on adaptive scales. The present study is a step towards developing a measurement scale that is more tailored to specific communication domains, which should enhance both the validity and reliability of our research.

## LIMITATIONS

There are several limitations to this study that are important to highlight. The study compared only FtF and texting communication, which are the most popular forms of communication in relational dyads. Future studies should compare other modalities of mediated communication. Different modalities will inevitably shape both the amount and types of cues available in the communication environment, which will, in turn, shape the uncertainty perceptions of the interacting partners. Further research should validate the measures in other communication environments. Additionally, the study relied on a single dependent variable to test the measures' predictive power. Although multiple measures of uncertainty were utilized in evaluating both transactional and interpersonal uncertainty measures, further studies are still needed to demonstrate a robust convergent and discriminant validity.

In re reviewing the uncertainty literatures, it is not hard to see the abundance of paper published based on URT and its long-standing rival: Predicted Outcome Value Theory (Sunnafrank, 1986). Communication scholars have long talk to with itself in theorizing uncertainty is sibling concepts in communication. Little to no attention have been paid to theoretical frameworks across disciplines. Questions must be asked how POV differs from Needs to belong (Baumeister & Leary, 1995)? Is there qualitative difference uncertainty individual face in the face of making a financial decision (Alchian, 1950) vs. uncertainty people face when getting to know someone? Does people who have higher needs for closure (Kruglanski, 2006) tends to perceive higher amounts of uncertainty in social interaction? Or is the case that Needs for closure is more of a sibling construct to uncertainty? Depending on how we address these questions, communication scholars may be readily to incorporates these other frameworks in theorizing the functionalities of uncertainty in interpersonal relationships.

## CONCLUSION

It has been nearly six decades since the initial publication of Uncertainty Reduction Theory. Numerous adaptations and spin offs of the theory have emerged over this time. To this day, the theory remains one of the most cited in the field of communication. What has changed is the information environment that people encounter when communicating with their relational partners. Like any theory, the resilience of URT's core ideas has proven to be exceptional. The current studies reflect the evolving nature of how uncertainty can be understood in interpersonal communication, particularly highlighting the role of the information environment and unique interpersonal knowledge that formulates our perception of uncertainty. With this newly established measure, more experiments can be conducted in comparing interactive and non-interactive social interactions. For example, online dating researcher can assess the differences in uncertainty reduction between images with text information vs. synchronous interactions in gaining interpersonal impression and its impacts on relational outcomes. Interpersonal communication research could unitarize the scale how various relational phenomena increase or decrease interpersonal uncertainties and its impacts in mediating relational outcomes, such as trust, attraction, and relationship satisfaction.

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## APPENDIX A: SURVEY ITEMS

Table 1

*Interpersonal Uncertainty*

---

How confident are you in your ability to anticipate the reactions of partner's towards your own behavior?  
How accurate are you at predicting the values your partner holds about you?  
How accurate are you at predicting your partner's attitudes towards you?  
How well can you predict your partner's feelings and emotions towards you?

---

Table 2

*Personal Uncertainty*

---

How confident are you in your ability to interpret the non-verbals of your partner?  
How accurate do you think your predictions of your partner's behavior in social situations are?  
  
How accurate are you at predicting the values he/she holds?  
How confident are you in your ability to predict the preferences of your partner?  
How accurate are you at predicting his/her attitudes?

---

Table 3

*Transnational Personal Uncertainty*

---

How well can you predict the reactions of your partner through text messages/FtF Conversation?  
How certain are you that you are able to accurately predict the motives of your partner through texting/FtF conversation?  
How confident are you in your ability to predict the opinions of your partner about specific topics through texting/ FtF conversation?  
How confident are you in your ability to predict the outcomes of conversations with your partner through texting/ FtF conversation?  
When communicating via text/FtF, how accurate are you at understanding your partner's attitudes?

---

Table 4

*Transnational interpersonal*

---

When texting with your partner, how much do you think your partner can emphasize with you?  
When texting with your partner, how confident are you in your partner's ability to understand the tone of your text messages?  
  
How certain are you that your partner is able to accurately predict your motives through text messages?  
How confident are you in your partner's ability to relate to you through texting?

---

Table 5

*Heterotrait-Monotrait Ratio*

| Interpersonal | Personal | Transactional<br>Personal | Transactional<br>Interpersonal |
|---------------|----------|---------------------------|--------------------------------|
| 1.00          |          |                           |                                |
| 0.81          | 1.00     |                           |                                |
| 0.70          | 0.63     | 1.00                      |                                |
| 0.60          | 0.59     | 0.82                      | 1.00                           |

Table 6

*Interpersonal, Personal, Transactional, Relationship Length on Texting Communication Quality*

| Variable                       | B      | SE    | Standardized<br>Coefficient | t      | p      |
|--------------------------------|--------|-------|-----------------------------|--------|--------|
| Relationship<br>Length         | -0.001 | 0.003 | -0.025                      | 5.866  | 0.695  |
| Interpersonal<br>Uncertainty   | 0.006  | 0.005 | 0.112                       | -0.393 | 0.211  |
| Personal<br>Uncertainty        | -0.001 | 0.005 | -0.026                      | 1.256  | 0.769  |
| Transactional<br>Personal      | 0.008  | 0.004 | 0.231                       | 2.245  | 0.026  |
| Transactional<br>Interpersonal | 0.011  | 0.003 | 0.346                       | 3.514  | <0.001 |

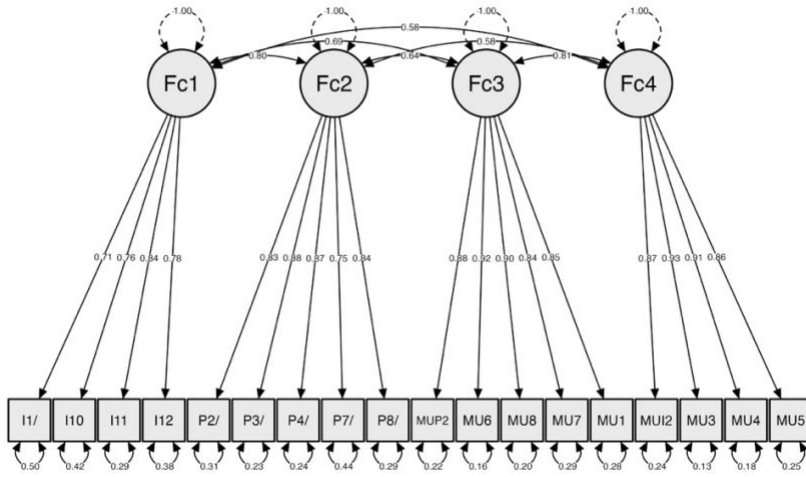
Table 7

*Interpersonal, Personal, Transactional, Relationship Length on FtF Communication Quality*

| Variable                       | B      | SE    | Standardized<br>Coefficient | t      | p     |
|--------------------------------|--------|-------|-----------------------------|--------|-------|
| Relationship<br>Length         | 0      | 0.002 | 0.017                       | 0.249  | 0.803 |
| Interpersonal<br>Uncertainty   | 0.006  | 0.003 | 0.171                       | 1.865  | 0.064 |
| Personal<br>Uncertainty        | 0.008  | 0.005 | 0.187                       | 1.633  | 0.104 |
| Transactional<br>Personal      | -0.006 | 0.005 | -0.156                      | -1.349 | 0.179 |
| Transactional<br>Interpersonal | 0.024  | 0.004 | 0.36                        | 3.301  | 0.001 |

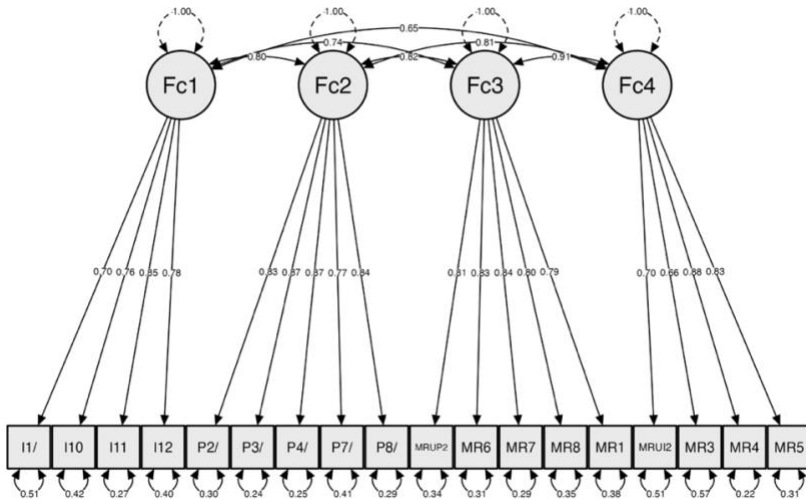
## APPENDIX B: CFA

Figure 1  
CFA Model for Texting Communication



Note: Factor 1: Interpersonal, Factor 2: Personal, Factor 3: Transcational Personal, Factor 4: Transcational Interpersonal

Figure 2  
CFA model for FtF Communication\*



Note: Factor 1: Interpersonal, Factor 2: Personal, Factor 3: Transcational Personal, Factor 4: Transcational Interpersonal

\*CFA model for FtF was not reported as part of the measurement development analysis, as the measure was exactly the same as texting communication with only change with respect to media modality. CFI 0.93, SRMR 0.04, RMSEA 0.08, Cronbach Alpha 0.95, and AVE all above 0.6, HTMT all below 0.9.