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Relationships between measures of I- and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information-seeking

Jordan A. Litman*

Department of Psychology, University of South Florida, St. Petersburg, Tampa, FL 33613, United States

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ABSTRACT

In two studies, hypotheses suggested by Litman's (2005) wanting-liking model of information-seeking were tested. In Study 1 ($N = 372$) relationships between measures of dispositional Interest- (I) and Deprivation- (D) type curiosity, ambiguity tolerance (AT), and negative affectivity were examined. Consistent with the wanting-liking model, AT correlated positively with I-type curiosity and negatively with D-type curiosity. Also as predicted, I-type curiosity correlated negatively with negative traits, D-type curiosity correlated positively, and AT had minimal relationships. In Study 2 ($N = 158$), correlations between trait I- and D-type curiosity and need for closure (NFC) were examined. Generally consistent with expectations, I-type curiosity correlated negatively with NFC, and D-type curiosity was related positively, although the relationships were very weak.

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1. Introduction

Curiosity, the intrinsic desire to seek out and acquire new information (Berlyne, 1966; Loewenstein, 1994), comprises two basic goals: The first involves obtaining information expected to stimulate positive feelings of interest (I-type), while the second is concerned with reducing undesirable states of informational deprivation (D-type) (Litman, 2008). I-type curiosity is activated when individuals recognize opportunities to discover something entirely new, whereas D-type curiosity is stimulated when people lack information they intend to incorporate into an existing body of knowledge (Litman, 2008; Litman, Hutchins, & Russon, 2005; Litman & Jimerson, 2004; Litman & Spielberger, 2003; Loewenstein, 1994). While the concept of I-type curiosity is highly consistent with the classic conceptualization of fully intrinsic motivation, D-type curiosity is a somewhat more "integrated" motive in that it also involves extrinsically regulated concerns about the accuracy and relevance of newly gathered information (Litman, 2008; Ryan & Deci, 2000). Once activated, the degree to which each type of curiosity is experienced and behaviorally expressed varies according to individual differences in relatively stable I- and D-type curiosity tendencies (Litman & Jimerson, 2004; Litman & Spielberger, 2003), measures of which assess positively correlated but psycho-

metrically distinct dimensions of trait-curiosity (Litman, 2008; Litman & Jimerson, 2004; Litman & Silvia, 2006).

Although both I- and D-type curiosity orient individuals towards the resolution of uncertainty (Hodson & Sorrentino, 1999; Sorrentino & Roney, 2000), they differ considerably in terms of their associated feeling-states and their abilities to energize information-seeking behavior.¹ I-type curiosity reflects a relaxed and pleasant "take it or leave it" feeling towards new knowledge; acquiring new information is viewed as potentially pleasurable but not a necessity. When I-type curiosity is stimulated, situations characterized by uncertainty are viewed positively, and opportunities to resolve that uncertainty are regarded as potentially enjoyable. Accordingly, scores on measures of I-type curiosity tendencies are negatively correlated or unrelated to negative affective tendencies such as anger, anxiety, and depression (Litman & Jimerson, 2004; Litman & Spielberger, 2003). For I-type curiosity, learning new information is rewarding because it induces positive feelings of enjoyment from engagement, entertainment or aesthetic pleasure associated with new information (Litman, 2005, 2008). By contrast, D-type curiosity is an intense and uncomfortable "need to know" associated with moderately unpleasant feelings of tension or frustration. Not surprisingly, scores on measures of D-type curiosity tendencies show small positive correlations with negative affective conditions such as

* Tel.: +1 813 774 2230.

E-mail address: jlitman@shell.cas.usf.edu

¹ Although curiosity can be conceptualized as an aspect of uncertainty-orientation (UO), it is not clear whether UO is primarily concerned with the "fun of learning" (I-type) or with reducing uncomfortable feelings of ignorance or confusion (D-type).

anger and anxiety (Litman 2005; Litman & Jimerson, 2004; Litman & Spielberg, 2003). When D-type curiosity is activated, conditions characterized by uncertainty are viewed as increasingly bothersome; consequently, D-type curiosity motivates seeking specific, objectively correct and relevant knowledge in order to resolve the uncertainty. For D-type curiosity, acquiring new information is rewarding because it *reduces* negative feelings attributed to uncertainty. These qualitative differences between I- and D-type curiosity – i.e., inducing interest or reducing tension, respectively – correspond to important quantitative differences in the extent to which they energize behavior; D-type curiosity is empirically associated with both more intense levels of reported state-curiosity and a greater degree of subsequent information-seeking behavior as compared to I-type curiosity (Litman et al., 2005).

Litman (2005) theorizes that the subjective experiences, intensities of emotional-motivational states, and consequent degree of information-seeking behavior differentially associated with I- and D-type curiosity can be explained by varying degrees of *wanting* and *liking* (Berridge, 1999) – two independent, but cooperative, sets of neural processes that underlie experiences of appetite and reward for food, water, drugs, sex, and even sensory stimulation (Berridge, 2001). Wanting refers to the activation of dopamine circuits, and corresponds to desire. As wanting increases, so does subjective discomfort until the appetite is satisfied. Liking reflects opiate activity implicated in both the anticipation and experience of pleasure due to satiation. However, because wanting and liking are dissociated processes, their relative degree of activation often differs in strength, which explains why it is possible to enjoy food (relatively high liking) in the absence of significant hunger (relatively low wanting) (Berridge, 2003, 2004).

In Litman's (2005) view, like other appetitive motives, experiences of curiosity also involve an interplay between desire (i.e., wanting new information) and expected pleasure (i.e., liking the information once acquired).² Litman theorizes that a condition of relatively high wanting and high liking is highly consistent with D-type curiosity, when the lack of information generates an uncomfortable need-state that strongly motivates behavior aimed at satiation. In contrast, a combination of relatively low wanting but moderately high liking is consistent with I-type curiosity, which involves information-seeking motivated purely by the anticipation of increased enjoyment, without the intense appetite of an unsatisfied need. The relationships between levels of wanting and liking in regard to curiosity and information-seeking are illustrated in Fig. 1.

1.1. Wanting, liking and other emotional-motivational tendencies relevant to information-seeking: Ambiguity tolerance and need for closure

Litman (2005) posits that other emotional-motivational tendencies relevant to information-seeking can also be explained in terms of wanting and liking. Often individuals realize they lack information, but are neither especially troubled by its absence, nor anticipate much pleasure to result from acquiring it. This amotivated state is consistent with the concept of *ambiguity tolerance* (AT). Tendencies to experience and express AT involve being comfortable with – and even preferring – conditions of sustained uncertainty (Frenkel-Brunswik, 1948; MacDonald, 1970; Norton, 1975). Individuals with strong AT tendencies do *not* feel compelled to obtain new information or arrive at definitive conclusions. Thus, AT reflects a motive to *accept rather than resolve uncertainty*, suggesting that AT tendencies may direct individuals to passively avoid

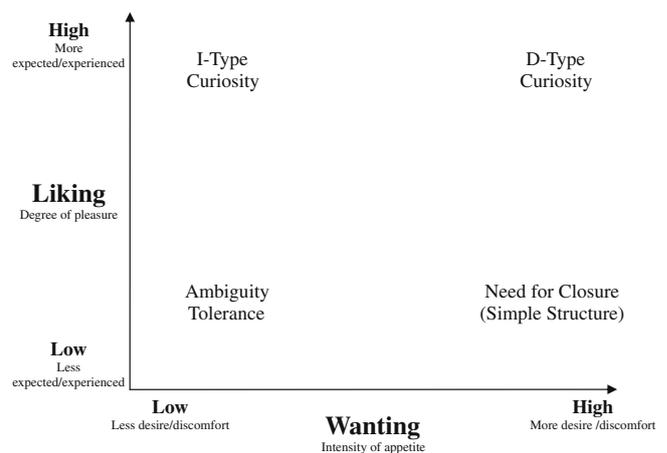


Fig. 1. Hypothesized emotional-motivational tendencies relevant to information-seeking associated with relatively high or low levels of wanting and liking.

opportunities to resolve uncertainty and learn new information. We may differentiate between AT and the related construct of intolerance for uncertainty (IU; Sexton & Dugas, 2008, 2009) in that IU is primarily concerned with avoiding information where the content is expected to generate increased worry and distress (e.g., information related to one's health and well-being). In situations such as these, approaching or avoiding new information may involve relatively little curiosity per se, and have more to do with efforts to cope with potential threats (Affi & Weiner, 2004). Contrary to conditions associated with IU when individuals would prefer to avoid uncertainty entirely, individuals with high levels of AT prefer having more questions than answers (Beitel, Ferrer, & Cece-ro, 2004; Durrheim & Foster, 1997; Norton, 1975). In short, AT involves being content with remaining in a state of uncertainty, even when new information is available. Thus, AT may be conceptualized as an emotional-motivational condition that involves relatively low levels of either wanting or liking new information (see Fig. 1).

In keeping with the wanting-liking model of information-seeking, AT should reflect a relatively weak motive to seek information, but also correspond to little discomfort with the unknown. Thus, AT should be positively related to I-type curiosity on the basis of similar levels of wanting. However, the model also describes AT as involving lower levels of anticipated liking for new information (ambiguity being preferred over potential clarity), so AT should diverge from positively valenced I-type curiosity tendencies in terms of its relationships to negative affect. Finally, the wanting-liking model of information-seeking predicts that AT will be negatively associated with D-type curiosity, given that D-type curiosity reflects an intense appetite for knowledge that demands satiation – in effect an *intolerance* for ambiguity that motivates the acquisition of specific and correct answers.

The last wanting-liking combination activation to consider involves relatively high wanting accompanied by little liking, a condition described as “irrational wanting” (Winkielman & Berridge, 2003). In relation to information-seeking, irrational wanting would be characterized by a strong desire for information to reduce uncertainty, even if the information is expected to have limited value in stimulating interest or improving understanding. Litman (2005) reasons that such a motive closely resembles *need for closure* (NFC; Webster & Kruglanski, 1994), a dispositional tendency to desire *any* answer when faced with the unknown, rather than endure the distress of uncertainty (see Fig. 1). Not surprisingly, individuals with high levels of dispositional NFC prefer learning simple answers over intellectually complex ones (Van Hiel & Mer-vielde, 2002; Webster & Kruglanski, 1994).

² See Litman (2005) for a detailed discussion on the limitations of traditional drive and optimal arousal models of curiosity and how they compare to the wanting-liking model.

Although Webster and Kruglanski (1994) described NFC as a relatively homogeneous construct, factor analytic research suggests that NFC encompasses two uncorrelated dimensions (Neuberg, Judice, & West, 1997). The first involves desiring order, predictability and certainty and is labeled “Need for Simple Structure” (NSS). The second, labeled “Decisiveness”, involves moving hastily towards conclusions. The NSS dimension is positively associated with tendencies to experience negative affective conditions such as anxiety, and appears to reflect discomfort with the unknown (Colbert, Peters, & Garety, 2006; Neuberg et al., 1997; Stalder, 2007). By contrast, the Decisiveness dimension is correlated *negatively* with anxiety, suggesting that it motivates going directly to a conclusion before any uncertainty-related distress can be experienced (Neuberg et al., 1997). Thus, both dimensions of NFC may involve being oriented more towards *maintaining clarity* rather than obtaining new information (Hodson & Sorrentino, 1999; Sorrentino & Roney, 2000).

In keeping with a wanting-liking model of information-seeking, NSS would be conceptualized as a strong motive to eliminate uncertainty; therefore, NSS should be positively associated with D-type curiosity on the basis of motivational strength. However, because NSS directs individuals to seek the *simplest* answer rather than pursue the most accurate and useful information available, the magnitude of the relationship should be relatively small. Given NSS's empirical association with experiences of distress, the model predicts that this construct should be negatively associated with I-type curiosity, which involves little immediate discomfort and a relatively high degree of expected pleasure once the unknown is resolved. By contrast, the Decisiveness dimension, which diverges from NSS and appears to be somewhat positively valenced (Neuberg et al., 1997), should correlate positively with I-type curiosity. However, Decisiveness should be negatively associated with D-type curiosity given that it reflects tendencies to move quickly to a conclusion, even an erroneous one, whereas D-type curiosity emphasizes devoting time and effort to finding the right answer.

To test the relationships between I- and D-type curiosity, AT, and NFC suggested by the wanting-liking model of information-seeking, two studies were conducted. In Study 1 correlations between tendencies to experience and express I- and D-type curiosity and AT were examined. The relationships between these variables and tendencies to experience negative affectivity were also examined in order to determine if, as hypothesized, dispositional AT tendencies involve relatively little distress with the unknown, as well as to verify the hypothesized relationships between these negative traits with I- and D-type curiosity. In Study 2 relationships between measures of individual differences in I- and D-type curiosity and NFC were evaluated.

2. Study 1

In Study 1, relationships between individual differences in I- and D-type curiosity and AT were examined. In keeping with the wanting-liking model of information-seeking, AT was expected to be positively related to I-type curiosity and negatively correlated with D-type curiosity. The curiosity scales were expected to be more highly correlated with each other than with AT, based on the view that curiosity directs individuals to seek new information whereas AT is associated with eschewing new information in favor of maintaining conditions of uncertainty. Additionally, given that there has been relatively little investigation of the relationship between AT and negative affectivity (but see Andersen & Schwartz, 1992; DeRoma, Martin, & Kessler, 2003), correlations between individual differences in AT and three negative dispositions (anxiety, depression, and anger) were also examined.

Based on the theoretical view that AT involves little wanting or liking, it was expected to have very minimal relationships with negative affective conditions. In keeping with the view that I-type curiosity is a positively valenced emotional-motivational condition (relatively low wanting, but high liking due to expected enjoyment) and D-type curiosity is somewhat negatively valenced (uncomfortably high wanting, high liking due to expected relief), I-type curiosity was hypothesized to correlate negatively with measures of negative affect, whereas D-type was expected to correlate positively.

2.1. Method

2.2.1. Participants

The participants were 372 students (250 women, 122 men), ranging in age from 19 to 41 ($M = 21.2$, $SD = 3.66$), recruited from undergraduate psychology and statistics courses at a large South-eastern university in the United States. All participants received course credit for taking part in this study.

2.2.2. Instruments

The *I/D Curiosity Questionnaire* included five items selected from the Epistemic Curiosity Scale (Litman & Spielberger, 2003) to measure I-type curiosity (e.g., “I enjoy exploring new ideas”), and five items taken from the Curiosity as a Feeling-of-Deprivation scale (Litman & Jimerson, 2004) to assess D-type curiosity (e.g., “I can spend hours on a single problem because I just can't rest without knowing the answer”). These two 5-item scales were recently identified as being the best, most differentiated measures of each curiosity construct (Litman, 2008). In past research, these very brief instruments have demonstrated acceptable internal consistency on the basis of alphas $\geq .72$, mean inter-item correlations $\geq .37$, and mean item-total correlations $\geq .50$. Additionally, the validity of the two curiosity scales has been demonstrated on the basis of positive correlations with other curiosity instruments and minimal relationships with measures of other constructs (Litman & Jimerson, 2004; Litman & Silvia, 2006; Litman & Spielberger, 2003). Participants were instructed to report how they “generally feel” regarding each item statement by rating themselves on a 4-point frequency scale ranging from “almost never” to “almost always”.

The *Ambiguity Tolerance* (AT) scale is a 20-item instrument developed by Macdonald (1970) to measure individual differences in tendencies to tolerate or prefer stimuli and situations characterized by ambiguity, vagueness, and uncertainty (e.g., “A problem has little attraction for me if I don't think it has a solution”, *reverse scored*). For each AT scale item, participants reported whether the item was “true” or “false” in describing them. Alphas ranging from .65 to .86 have been reported for the AT scale (Beitel et al., 2004; Macdonald, 1970). In the present study, the AT scale's alpha was less than desirable ($\alpha = .64$); thus, three AT items with low item-total correlations were dropped, which improved alpha to .70.³

The *Spielberger Trait (T) Anxiety, Anger, and Depression Scales* are three 10-item measures of the frequency that corresponding emotional-motivational states of anxiety (e.g., “I feel nervous and restless”), anger (e.g., “I am a hot-headed person”), and depression (e.g., “I feel depressed”), respectively, are generally experienced. Participants responded to each item by rating themselves on the same 4-point scale used with the *I/D Curiosity Questionnaire*. In previous research the T-Anxiety, T-Anger, and T-Depression scales had alphas ranging from .80 to .96 (Spielberger, 1979).

³ Correlations with the 20-item AT scale were similar to those obtained with the 17-item version, and would not have altered the conclusions for Study 1.

2.2. Procedure

The questionnaire materials were administered to participants in large-group testing sessions. Approximately 20 min were required to participate. The experimenter introduced himself to the participants, indicated that the goals of the study were to learn about their feelings and attitudes, and informed them that additional information would be provided after they had finished responding.

2.3. Results

Means, standard deviations, and alpha coefficients for the I- and D-type curiosity scales, the AT scale, and the three measures of negative affect are reported in Table 1. Alphas were generally acceptable for all of the scales ($\alpha \geq .70$). Correlations between the curiosity scales and the AT scale, and between these scales and the measures of negative affect are also reported in Table 1. Given that, as expected, the I- and D-type scales were moderately positively correlated ($r = .48$), in order to evaluate the unique relationship between each curiosity measure and the other scales, partial correlations were computed. Thus, each correlation between the I-type curiosity scale and the other four measures reflected the partialing out of D-type curiosity, while the variance accounted for by I-type curiosity was partialled out of each correlation between the other scales and D-type curiosity. As hypothesized, the AT scale was positively correlated with I-type curiosity but negatively related to D-type; consistent with expectations, the magnitude of the relationship between the two curiosity scales was greater than the correlation of either curiosity measure with AT. Also as hypothesized, the three negative traits were either negatively correlated or unrelated to I-type curiosity and had small positive correlations with D-type curiosity. Generally consistent with expectations, two of the three negative traits were unrelated to AT, but a small significant negative correlation was found between AT and T-Anger.

2.4. Study 1 discussion

The results of Study 1 were generally supportive of the wanting-liking model of information-seeking. As hypothesized, AT was positively correlated with I-type curiosity, and negatively associated with D-type curiosity. Consistent with expectations and past research (Litman & Jimerson, 2004; Litman & Spielberger, 2003), I-type curiosity correlated negatively with measures of negative affect while D-type curiosity was positively associated. Also as predicted, AT was unrelated to experiences of depression and anxiety. However, unexpectedly, AT was found significantly negatively related to T-Anger, presumably because AT involves the absence of feeling frustrated when information is missing.

3. Study 2

In Study 2 relationships between I- and D-type curiosity and NFC were examined. In keeping with the wanting-liking model of information-seeking, the NFC total scale and the NSS measure were expected to correlate negatively with I-type curiosity and to have small positive correlations with D-type curiosity. Decisiveness was expected to correlate positively with I-type but negatively with D-type. The curiosity scales were hypothesized to be more strongly related to each other than to the NFC scales.

3.1. Methods

3.2.1. Participants

The participants were 158 students (112 women, 46 men), ranging in age from 18 to 51 ($M = 22.23$, $SD = 5.39$), recruited from undergraduate psychology and statistics courses at a large South-eastern university in the United States. All participants received course credit for taking part in this study.

3.2.2. Instruments

The I/D Curiosity Questionnaire, which comprises a 5-item I-type and a 5-item D-type scale, was the same instrument from Study 1. Participants were instructed to report how they “generally feel” for each item on a 4-point frequency scale anchored by “almost never” and “almost always”.

The NFC scale (Webster & Kruglanski, 1994) is a 42-item measure that assesses dispositional tendencies to eliminate uncertainty with simple over complex answers. Webster and Kruglanski (1994) report an alpha of .84 for the NFC total scale. Additionally, 25 items that specifically refer to preferring order and predictability and disliking ambiguity were summed to form a NSS scale (e.g., “I dislike it when a person’s statement could mean many different things”), while five items that assess wanting to move quickly to conclusions were summed to form a Decisiveness scale (e.g., “When faced with a problem I usually see the one best solution very quickly”) (Neuberg et al., 1997). Respondents indicated the extent to which they endorsed each NFC item on a 6-point Likert scale ranging from “strongly agree” to “strongly disagree”.

3.2. Procedure

The questionnaires were administered in large-group testing sessions, and required approximately 20 min to complete. After the experimenter introduced himself, he indicated to the participants that the goals of the study were to learn about their feelings and attitudes. Participants were provided additional information after completing the questionnaires.

Table 1

Means, standard deviations, alpha coefficients, and correlations between measures of I- and D-type curiosity, ambiguity tolerance, and negative affect ($N = 372$).

	M (SD)	α	I-type	D-type	Ambiguity tolerance
I-type	14.19 (3.03)	.78			
D-type	10.77 (3.14)	.77	.48		
Ambiguity tolerance	8.65 (3.48)	.70	.36	-.15	
Trait-anxiety	20.00 (5.33)	.82	-.13	.19	-.02
Trait-depression	18.08 (5.43)	.85	-.18	.15	.03
Trait-anger	21.22 (6.11)	.89	-.02	.17	-.15

Each correlation between I- and D-type curiosity with AT and the measures of negative affect reflects the partialing out of the other curiosity scale. For $r \geq .11$, $p < .05$.

Table 2

Means, standard deviations, alpha coefficients, and correlations between measures of I- and D-type curiosity and need for closure ($N = 158$).

	<i>M</i> (<i>SD</i>)	α	I-type	D-type
I-type	13.71 (3.08)	.79		
D-type	11.29 (3.01)	.74	.49	
Need for closure total scale	132.58 (15.39)	.85	-.20	.09
Need for simple structure	88.71 (12.61)	.84	-.10	.08
Decisiveness	22.178 (4.23)	.65	.06	-.11

Each correlation between I- and D-type curiosity with the NFC measures reflects the partialing out of the other curiosity scale. For $r \geq .16$, $p < .05$.

3.3. Results

Means, standard deviations, and alphas for the I- and D-type curiosity scales and the three NFC measures are reported in Table 2. Alphas were acceptable for both curiosity scales and for two of the three NFC measures ($\alpha \geq .70$). Although alpha for the 5-item Decisiveness scale was somewhat lower than desirable ($\alpha = .65$), it was deemed acceptable for such a brief measure. Correlations between the curiosity and NFC scales are also reported in Table 2. As in Study 1, the I- and D-type scales were found moderately correlated ($r = .49$); therefore partial correlations were computed between each curiosity scale and the NFC measures to evaluate the unique relationship between each curiosity measure and NFC. Thus, each correlation between I-type curiosity and the other measures reflects the partialing out of D-type curiosity, and vice versa. Generally consistent with the hypotheses of Study 2, I-type curiosity correlated negatively with the NFC total scale and the NSS scale, although only the relationship with the total scale was significant. As hypothesized, the correlations for D-type curiosity with the NFC total scale and the NSS scale were positive and very small in magnitude. However, neither correlation was significant. Also as predicted, I-type curiosity correlated positively with Decisiveness, while D-type curiosity correlated negatively, although again, neither correlation was significant. As hypothesized, the two curiosity scales were more highly correlated with each other than with the NFC measures.

3.4. Study 2 discussion

While the direction and magnitude of the correlations between the curiosity and NFC measures were in line with predictions of the wanting-liking model of information-seeking, these correlations must be interpreted with considerable caution given that most of them were not statistically significant. Thus, the results of Study 2 can be interpreted as providing only very limited support for the wanting-liking model.

4. General discussion

The results of the present studies were, overall, generally consistent with the wanting-liking model of information-seeking. The findings of Study 1 were particularly supportive, and provided evidence of the complex interplay between experiences of desire and anticipated pleasure theorized to be associated with motives to seek or eschew new information. However, the results of Study 2 were only modestly supportive of the wanting-liking model; in particular, the very weak relationships found with D-type curiosity raise questions about whether the NFC construct is as representative of irrational wanting (i.e., high wanting and low liking) as originally hypothesized. Possibly, irrational wanting is better captured by motives that reflect desiring information expected to be *disliked* rather than simply liked to a lesser degree. In keeping with this idea, another construct that Litman (2005) posited might corre-

spond to irrational wanting is *morbid curiosity*, which involves a compulsion to obtain information that may be disturbing – a true approach-avoidance conflict that requires one to decide whether knowing or not knowing is more adverse. It will be important to examine this possibility in future research on the validity of the wanting-liking model of information-seeking. Accordingly, it will also be important in future research to investigate how I- and D-type curiosity, AT, and NFC relate to different expressions of being orientated towards resolving or avoiding uncertainty (e.g., Hodson & Sorrentino, 1999; Sexton & Dugas, 2009); a consideration of higher order concepts such as generalized tendencies to approach or avoid the unknown may help elucidate some of the complexities inherent in the wanting-liking model of information-seeking.

A limitation of the present studies is that *tendencies* to experience emotional-motivational states were examined rather than the actual states and consequent behaviors themselves – thus, these studies were relatively indirect tests of the wanting-liking model. It would therefore be desirable to examine the relationships among these variables in a follow-up study that also assesses transient states as well as providing opportunities for participants to seek (or choose not to seek) new information. Another limitation of the present studies is that all of the participants were university students, who may differ from non-students in regard to their attitudes about seeking new information; thus, it will be important in future research to evaluate the relationships between curiosity, AT, NFC, and other related constructs relevant to the wanting-liking model of information-seeking using a broader sample.

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