Running Head: VALENCE VERSUS AMBIVALENCE

Ambivalence versus Valence: Analyzing the Effects of Opposing Attitudes

Kenneth D. Locke and Curt C. Braun

University of Idaho

Full citation for this manuscript: Locke, K.D., & Braun, C.C. (2009). Ambivalence versus valence: Analyzing the effects of opposing attitudes. *Social Cognition, 27(1)*, 89-104.

Address correspondence to:
Kenneth Locke
Department of Psychology
University of Idaho
Moscow ID 83844-3043
Office: 208-885-4453
Fax: 208-885-7710
E-mail: klocke@uidaho.edu

Abstract

Attitudinal ambivalence refers to holding equivalently strong positive attitudes (ATT_{POS}) and negative attitudes (ATT_{NEG}) towards the same attitude object. We demonstrate two problems with common measures of attitudinal ambivalence. First, they contain multiple assumptions about how people weigh and balance ATT_{POS} and ATT_{NEG} that are not separately tested. Second, they are often confounded with attitude valence; specifically, they are confounded with ATT_{POS} to the extent that most respondents' attitudes are more negative than positive and with ATT_{NEG} to the extent that most respondents' attitudes are more positive than negative. To solve these problems, we introduced an alternative procedure—using hierarchical regression—for analyzing effects of potentially opposing attitudes, and demonstrated (with 286 American and 126 Chinese participants) how it produced more revealing and often more parsimonious models of the effects of ATT_{POS} and ATT_{NEG} on conflicted feelings, behavioral tendencies, culture, and life satisfaction.

Ambivalence versus Valence: Analyzing the Effects of Opposing Attitudes

Attitudinal ambivalence refers to holding equivalently strong positive and negative attitudes towards the same attitude object. Various models for computing ambivalence from separate positive and negative evaluations have been proposed (Thompson, Zanna, & Griffin, 1995). The models generally compute ambivalence as a sum of (a) the overall *intensity* or strength of the positive and negative attitudes and (b) the *similarity* in the strength of the positive and negative attitudes.

The earliest model was the Conflicting Relations Model (CRM; Kaplan, 1972), which can be written as:

$$ATT_{AMB} = (ATT_{POS} + ATT_{NEG}) - |ATT_{POS} - ATT_{NEG}|, \quad (1)$$

where ATT_{POS} is positive attitude strength, ATT_{NEG} is negative attitude strength, and ATT_{AMB} is attitudinal ambivalence. The first half of the equation computes intensity as the sum of ATT_{POS} and ATT_{NEG}. The second half of the equation computes similarity as the inverse of the absolute difference between ATT_{POS} and ATT_{NEG}; Figure 1 graphs this second part of the CRM equation and shows that it is maximized at the $ATT_{POS} = ATT_{NEG}$ line. Figure 2 graphs the complete CRM function and shows that adding the intensity component essentially "tips up" the back of Figure 1 (where the attitudes are stronger). Consequently, CRM is maximized when both ATT_{POS} and ATT_{NEG} are at their maximum and is minimized when either ATT_{POS} or ATT_{NEG} is at its minimum.

A slight variant of the CRM is the Similarity-Intensity Model (SIM), which can be written as:

$$ATT_{AMB} = (ATT_{POS} + ATT_{NEG})/2 - |ATT_{POS} - ATT_{NEG}|. \quad (2)$$

The only difference between CRM and SIM is that SIM computes intensity as the average (rather than the sum) of ATT_{POS} and ATT_{NEG}. Therefore, as Figure 3 shows, SIM gives the intensity component half the weight that CRM does and thus "tips up" Figure 1 up half as much as CRM does. After being endorsed by Thompson et al. (1995), SIM quickly became the most popular ambivalence index and in recent years has been applied to a diversity of topics (e.g., Armitage & Conner, 2000; Faina, Costarelli, & Romoli, 2002; Fong, 2006; Kachadourian, Fincham, & Davila, 2005; van Harreveld et al., 2004; Riketta & Ziegler, 2007; Rudolph & Popp, 2007; Zemborain & Johar, 2007).

Implicit or explicit in definitions of attitudinal similarity (and thus attitudinal ambivalence) is the concept of *attitudinal balance* (ATT_{BAL}): For a given attitude object, individuals whose positive attitudes are stronger than their negative attitudes are *positive respondents* (ATT_{BAL} = +1), individuals whose negative attitudes are stronger than their positive attitudes are *negative respondents* (ATT_{BAL} = -1), and individuals whose positive and negative attitudes are equally strong are *balanced respondents* (ATT_{BAL} = 0). For example, the standard measure of similarity used in the SIM and CRM can be rewritten as follows:

$$-|ATT_{POS} - ATT_{NEG}| = -ATT_{BAL}*ATT_{POS} + ATT_{BAL}*ATT_{NEG}. \quad (3)$$

Equation 3 shows that for positive respondents, similarity = $ATT_{NEG} - ATT_{POS}$; that is, similarity increases as ATT_{NEG} increases or ATT_{POS} decreases. Conversely, for negative respondents, similarity = $ATT_{POS} - ATT_{NEG}$; that is, similarity increases as ATT_{POS} increases or ATT_{NEG} decreases. Figure 1 shows these patterns graphically (with positive respondents falling to the right and negative respondents to the left of the center line).

Rewriting similarity in terms of ATT_{BAL} allows us to rewrite CRM as follows:

$$CRM = ATT_{POS} + ATT_{NEG} - ATT_{BAL}*ATT_{POS} + ATT_{BAL}*ATT_{NEG}. \quad (4)$$

When researchers use CRM to predict an outcome (Y), they present the test as $Y = b_0 + b_1CRM + e$. However, Equation 4 shows the model actually tested is:

$$Y = b_0 + b_1(ATT_{POS}) + b_1(ATT_{NEG}) - b_1(ATT_{BAL}*ATT_{POS}) + b_1(ATT_{BAL}*ATT_{NEG}) + e. \quad (5)$$

Likewise, SIM can be rewritten as follows:

$$SIM = 0.5ATT_{POS} + 0.5ATT_{NEG} - ATT_{BAL}*ATT_{POS} + ATT_{BAL}*ATT_{NEG}. \quad (6)$$

When researchers use SIM to predict an outcome, they present the test as $Y = b_0 + b_1SIM + e$. However, Equation 6 shows the model actually tested is:

$$Y = b_0 + 0.5b_1(ATT_{POS}) + 0.5b_1(ATT_{NEG}) - b_1(ATT_{BAL}*ATT_{POS}) + b_1(ATT_{BAL}*ATT_{NEG}) + e. \quad (7)$$

Thus, ambivalence indices define a specific type of interaction between ATT_{POS} and ATT_{NEG}. The standard statistical approach to testing the effects of higher-order interaction terms is to control the variance explained by lower-order terms. To quote a respected statistical text: "…if we omit lower order terms, then the variance attributed to higher order terms will be confounded with variance attributable to the omitted lower order terms" (Cohen, Cohen, West, & Aiken, 2003, p. 234). Yet, ambivalence research has done just that: tested the effect of ambivalence without controlling for lower-order terms.

This is particularly problematic because ambivalence typically is confounded with attitude valence. Among positive respondents, stronger ATT_{POS} increases attitude strength but decreases similarity, yielding both positive and negative effects on ATT_{AMB} that cancel each other out, leaving ATT_{NEG} as (depending on the formula) the main or only predictor of ATT_{AMB}. Likewise, among negative respondents, stronger ATT_{NEG} increases attitude strength but decreases similarity, yielding both positive and negative effects on ATT_{AMB} that cancel each other out, leaving ATT_{POS} as the main or only predictor of negative respondents' ATT_{AMB}. Therefore, ATT_{AMB} will be confounded with ATT_{NEG} to the extent that a sample contains mostly

positive respondents and confounded with ATT_{POS} to the extent that a sample contains mostly negative respondents.

To solve the problems associated with ambivalence indices, we recommend analyzing the effects of potentially contradictory attitudes using the following unconstrained regression model:

$$Y = b_0 + b_1(ATT_{POS}) + b_2(ATT_{NEG}) + b_3(ATT_{BAL}) + b_4(ATT_{BAL}*ATT_{POS}) + b_5(ATT_{BAL}*ATT_{NEG}) + e. \quad (8)$$

Comparing equation 5 to equation 8 shows that CRM puts the following constraints on the unconstrained regression model: $b_1 = b_2 = -b_4 = b_5$, and $b_3 = 0$. Comparing equation 7 to equation 8 shows that SIM imposes the following constraints: $2b_1 = 2b_2 = -b_4 = b_5$, and $b_3 = 0$. Each constraint is a prediction (Edwards, 2002). For example, $b_1 = b_2$ is the prediction that the linear effects of ATT_{POS} and ATT_{NEG} are identical. We cannot test these predictions individually when they are intermingled within a larger ambivalence formula.

To clarify the distinct linear and non-linear effects of positive and negative attitudes and whether they conform to the assumptions underlying ambivalence indices, we suggest testing the unconstrained model (equation 8) using the following hierarchical procedure. In Step 1, enter the first-order terms: ATT_{POS} and ATT_{NEG}. In Step 2, add the moderating variable: ATT_{BAL}. In Step 3, add the interaction terms: $ATT_{BAL}*ATT_{POS}$ and $ATT_{BAL}*ATT_{NEG}$. (See Edwards [2002] for a similar but more elaborate method for addressing analogous problems with difference scores.)

Using this procedure, the regression coefficients provide the following information. B_1 is the linear effect of ATT_{POS}; a positive b_1 means that stronger positive attitudes predict greater outcomes; a negative b_1 means that weaker positive attitudes predict greater outcomes. B_2 is the linear effect of ATT_{NEG}; a positive b_2 means that stronger negative attitudes predict greater outcomes; a negative b_2 means that weaker negative attitudes predict greater outcomes. B_3 is the

effect of being a positive or negative respondent; a positive b_3 means that outcomes are (more than expected given b_1 and b_2) greater for positive than negative respondents; a negative b_3 means that outcomes are (more than expected) greater for negative than positive respondents. B_4 is the effect of ATT_{POS} moderated by ATT_{BAL}; a positive b_4 means that (more than expected given the effects of the other variables) stronger positive attitudes predict higher outcomes among positive respondents or lower outcomes among negative respondents; a negative b_4 means that (more than expected) stronger positive attitudes predict higher outcomes among negative respondents or lower outcomes among positive respondents. B_5 is the effect of ATT_{NEG} moderated by ATT_{BAL}; a positive b_5 means that (more than expected) stronger negative attitudes predict higher outcomes among positive respondents or lower outcomes among negative respondents; a negative b_5 means that (more than expected) stronger negative attitudes predict higher outcomes among negative respondents or lower outcomes among positive respondents.

The distinctive feature of an ambivalence model is the interaction terms (which test the hypothesis that the effect of a positive or negative attitude depends on whether it is the stronger or weaker attitude). If these interaction terms do not improve the predictive power of the model, then they should be omitted in favor of a simpler model in which the effects of positive and negative attitudes are independent.

We tested the utility of our approach with outcomes that have been used in previous ambivalence research. First, we tested if positive and negative attitudes predicted conflicted feelings and frequencies of various personal behaviors (e.g., exercising). Previous studies show that ambivalence indices consistently predict self-reports of conflicted feelings (Priester & Petty, 1996; Thompson et al., 1995), but are less consistent in predicting actual behavior (Armitage & Conner, 2000). Second, we replicated a portion of a larger series of studies by Spencer-Rodgers,

Peng, Wang, and Hou (2004)—specifically, that portion in which Chinese and American participants completed a life satisfaction scale and the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). The RSES contains both positive and negative statements (e.g., "I feel that I have a number of good qualities" and "At times I think I am no good at all"). For each respondent, Spencer-Rodgers et al. computed the average response to the negative statements and the average response to the positive statements, and from these computed "self-evaluative ambivalence". They found that self-evaluative ambivalence was negatively associated with life satisfaction and was greater in China than America.

Method

Participants

The American participants were University of Idaho students (186 females, 100 males; age = 18 – 45 years, M = 20.6, SD = 3.0) who participated for extra credit in undergraduate psychology courses. Of those who reported their ethnicity, the most common responses were European American (84.9%), "Mixed" (7.0%), and Hispanic or Latino (3.9%). The Chinese participants were Guangxi University student volunteers (96 females, 26 males, 4 unknown; age = 18 – 29 years, M = 19.8, SD = 1.3).

Materials and Procedure

Both the American and the Chinese participants completed the RSES and the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The RSES is a widely-used, reliable 10-item self-report measure of global self-esteem (for psychometric information, see Gray-Little, Williams, & Hancock, 1997). The SWLS is a widely-used, reliable 5-item measure of life satisfaction (for psychometric information, see Pavot & Diener, 1993). Responses on the RSES and SWLS were made on -2 (strongly disagree) to +2 (strongly agree) scales. The

materials were created in English and translated into Chinese by a Guangxi University English professor. The participants received materials in their native language and were tested in small groups.

The American (but not the Chinese) participants also completed measures assessing attitudes, feelings, and behavioral tendencies associated with the following behaviors: "exercising regularly", "eating a low-fat diet", "giving blood", "drinking alcohol", "watching television", and "cheating on exams or assignments". At the time of the study, the University of Idaho was attempting to encourage exercising, a low-fat diet, and donating blood (so we call these "desirable behaviors") and discourage drinking, inactivity (e.g., television watching), and cheating (so we call these "undesirable behaviors"). For each of these six behaviors participants were asked to indicate (a) "how negative your attitudes are" towards each behavior on 0 (not at all) to 2 (very) scales, (b) "how positive your attitudes are" towards each behavior on 0 (not at all) to 2 (very) scales, (c) "to what extent you have mixed or conflicted feelings" about each behavior on -2 (not at all) to +2 (very) scales, and (d) whether "during the past 6 months I have…" and "during the next 6 months I intend to…" engage in each behavior on -2 (strongly disagree) to +2 (strongly agree) scales. The wording of these items was similar to that used in prior studies of attitudinal ambivalence (e.g., Armitage & Conner, 2000; Priester & Petty, 1996; Thompson et al., 1995).

Results

The following analyses used the SIM formula to compute ATT_{AMB} since that is currently the most popular ambivalence index. We present the results first for the attitude data (from American participants) and then for the self-esteem and life satisfaction data (from American and Chinese participants).

Is Behavior Related to Attitudinal Ambivalence or Valence?

Participants' ratings of whether they had engaged in a behavior in the past and intended to engage in that same behavior in the future were highly correlated (*r*s ranged from .69 for exercising to .85 for drinking) and yielded similar results. Therefore, we averaged the two ratings to create a more stable index of behavioral tendencies. Then, for each behavior, we regressed behavioral tendencies on ATT_{AMB}.

Table 1 column 1 shows that ATT_{AMB} related negatively to desirable behaviors and positively to undesirable behaviors. Had we studied only desirable behaviors, we might conclude that ATT_{AMB} inhibits behavior. Had we studied only undesirable behaviors, we might conclude that ATT_{AMB} disinhibits behavior. Having studied both desirable and undesirable behaviors, we might conclude that ATT_{AMB} inhibits desirable behaviors but disinhibits undesirable behaviors.

However, before considering any conclusions, we tested our unconstrained regression model. To do so, we entered first the component attitudes (ATT_{POS} and ATT_{NEG}), second ATT_{BAL}, and third the interaction terms (ATT_{BAL}*ATT_{POS} and ATT_{BAL}*ATT_{NEG}). (Note that ATT_{BAL} is included in the regression to ensure unbiased estimates of the interaction terms. Typically the results for ATT_{BAL} per se will not be of interest, and in the current research were largely attributable to floor or ceiling effects.) The component attitudes (Step 1) explained a sizable proportion of the variance in every behavior, R^2s > .127, *p*s < .001. Specifically, behavior related negatively to ATT_{NEG} and positively to ATT_{POS} (see Table 1 columns 2-3). The interaction effects (Step 3; columns 5-6) did not explain additional variance, R^2s < .01, *p*s > .15. In sum, the effects of attitudes on behavior were due to positive and negative attitudes' independent effects; adding non-linear terms to the model was unnecessary.

Consequently, as the last column of Table 1 shows, the unconstrained model (columns 2-6)—and even step 1 (columns 2-3) alone—consistently explained more variance than did ATT_{AMB}, *p*s < .001.[1] But then why did ATT_{AMB} predict behavior at all? To understand why, recall that ATT_{AMB} is essentially positive respondents' ATT_{NEG} and negative respondents' ATT_{POS}. For example, in our data, among positive respondents the *r*s between ATT_{AMB} and ATT_{NEG} ranged from .94 to .97, and likewise among negative respondents the *r*s between ATT_{AMB} and ATT_{POS} ranged from .94 to .97. Consequently, if positive and negative respondents were not equally prevalent—as was the case for most behaviors—then attitudinal ambivalence and attitude valence were confounded.

Specifically, with regard to exercising, giving blood, and eating a low-fat diet, the ratios of positive to negative respondents were, respectively, 51: 1, 10:1, and 8:1. Since positive respondents (for whom $ATT_{AMB} \approx ATT_{NEG}$) predominated, ATT_{AMB} (by typically reflecting negative attitudes) predicted doing these behaviors *less*. With regard to drinking and cheating, the ratios of positive to negative respondents were, respectively, 1:2 and 1:29. Since negative respondents (for whom $ATT_{AMB} \approx ATT_{POS}$) predominated, ATT_{AMB} (by typically reflecting positive attitudes) predicted doing these behaviors *more*. Finally, with respect to watching television, the numbers of positive and negative respondents were almost identical; and since ATT_{AMB} did not (averaging across the sample) reflect either ATT_{POS} or ATT_{NEG}, ATT_{AMB} did not predict behavior.

To underscore the point, consider just those respondents whose attitudes were in the minority. With respect to exercising, giving blood, and eating a low-fat diet, negative respondents were the minority. Among these negative respondents $ATT_{AMB} \approx ATT_{POS}$, so ATT_{AMB} and behavior were positively associated (*r*s = 0.57, 0.35, and 0.32, respectively). Yet,

with negative respondents being so rare, across the entire sample the relationships between ATT_{AMB} and behavior were in the opposite direction. Conversely, with respect to drinking and cheating, positive respondents were in the minority. Among these individuals $ATT_{AMB} \approx ATT_{NEG}$, so ATT_{AMB} and behavior were negatively associated (*r*s = -.13 and -.10). But with positive respondents so outnumbered, across the entire sample the relationships between ATT_{AMB} and behavior were in the opposite direction.

Are Conflicted Feelings Related to Attitudinal Ambivalence or Valence?

Table 1 column 1 shows that direct ratings of conflicted feelings were positively related to ATT_{AMB}. However, we also tested an unconstrained model. Step 1 (ATT_{POS} and ATT_{NEG}) explained at least a marginally significant proportion of the variance in conflicted feelings for all behaviors (R^2s ranged from .019 to .169, *p*s < .07). Specifically, ATT_{NEG} predicted more conflicted feelings about all behaviors except cheating, while ATT_{POS} tended to predict less conflicted feelings about desirable behaviors and more conflicted feelings about undesirable behaviors (see Table 1 columns 2-3).

Adding interaction terms to the model (Step 3) yielded at least a marginal increase in the prediction of conflicted feelings for all behaviors except exercising (R^2s ranged from .013 to .066, *p*s ≤ .1). Table 1 columns 5-6 shows that there were generally negative effects of ATT_{BAL}*ATT_{POS} (suggesting that ATT_{POS} evokes conflicted feelings more for negative than positive respondents) and positive effects of ATT_{BAL}*ATT_{NEG} (suggesting that ATT_{NEG} evokes conflicted feelings more for positive than negative respondents). Simple effect analyses showed that more ATT_{NEG} predicted more conflicted feelings about drinking and low-fat diets among positive respondents, while more ATT_{POS} predicted more conflicted feelings about drinking among negative respondents, *p*s ≤ .05.

The last column of Table 1 shows that ATT_{AMB} was more effective as a model of how attitudes predict conflicted feelings than as a model of how attitudes predict behavioral tendencies. However, in no instance were all of the ambivalence model's predictions met. For example, whereas ATT_{AMB} predicts that stronger attitudes will *increase* conflicted feelings, in reality stronger ATT_{POS} towards exercising and giving blood and stronger ATT_{NEG} towards cheating *reduced* conflicted feelings, suggesting that endorsing widely shared attitudes—such as "giving blood is good" and "cheating is bad"—may evoke complacent or smug rather than conflicted feelings.

Is Culture Related to Self-Evaluative Valence or Ambivalence?

In the following analyses ATT_{POS} was the average of the five positive RSES items and ATT_{NEG} was the average of the five negative items. Our RSES items used bipolar (disagree to agree) scales, but traditionally ATT_{AMB} is computed on unipolar scales. For example, Spencer-Rodgers et al.'s (2004) RSES items used 1 (not at all) to 7 (very much) scales.[2] To confirm that our findings were not specific to bipolar scales, Dr. Spencer-Rodgers generously shared with us the self-esteem and life satisfaction data from Spencer-Rodgers et al.'s Study 3. The following analyses report results using data from both the current study (labeled "current data") and the Spencer-Rodgers et al. study (labeled "2004 data"). Table 2 shows the numbers of positive, negative, and balanced respondents in each data set.

Using binary logistic regression, we regressed culture (American = 0, Chinese = 1) on ATT_{AMB}. ATT_{AMB} was positively related to Chinese culture in both the current and the 2004 data (b = 0.89 and 0.32, SE = 0.12 and 0.09, Wald = 55.18 and 13.55, ps < .001). Testing the unconstrained model revealed that ATT_{NEG} was positively related to Chinese culture in the current data (b = 1.11, SE = 0.21, Wald = 27.99, p < .001) but not the 2004 data (b = 0.01, SE =

0.14, Wald = 0.01, *ns*), and ATT_{POS} was negatively related to Chinese culture in the 2004 data (*b* = -0.56, *SE* = 0.16, Wald = 12.56, $p < .001$) but not the current data (*b* = -0.31, *SE* = 0.21, Wald = 3.26, *ns*). The finding that Asian culture predicts more negative or less positive self-evaluations is in accord with previous findings (e.g., Heine, Lehman, Markus, & Kitayama, 1999); the discrepancy between the two data sets may be due to the differences in the samples, the response scales, or the items.[3] Adding the non-linear terms to the unconstrained model showed that ATT_{BAL}*ATT_{NEG} did not predict culture, but ATT_{BAL}*ATT_{POS} was negatively related to Chinese culture in both the current and the 2004 data (*B* = -0.89 and -0.67, *SE* = 0.41 and 0.19, Wald = 4.65 and 12.55, *p*s < .05). Table 2 clarifies the source of the interaction: Chinese reported less positive self-esteem than Americans, but only among positive respondents (*p*s < .001 in both data sets).

The unconstrained model correctly predicted a participant's culture (in the current and 2004 data) 70.9% and 66.0% of the time, while ATT_{AMB} did so 70.6% and 63.4% of the time. Thus, ATT_{AMB} performed better than chance (50%) and almost as well as the unconstrained model. However, the unconstrained model clarified that the non-linear effects were due mainly to cultural differences in positive respondents' ATT_{POS}, and that ATT_{AMB} was a poorer predictor in the 2004 data mainly because the ambivalence model assumes that the Chinese (being more ambivalent) will report *more* ATT_{POS}, when actually they reported *less* ATT_{POS}.

Is Life Satisfaction Related to Self-Evaluative Ambivalence or Valence?

In both data sets, greater ATT_{AMB} predicted lower life satisfaction among Americans but not among Chinese (see Table 3 column 1). However, we also tested an unconstrained model and found it consistently explained more variance than did ATT_{AMB} (see Table 3 column 7). In both cultures and both data sets, Step 1 (columns 2-3) explained a significant proportion of the

variance (R^2*s* ranged from 0.12 and 0.52, *p*s ≤ .001), with satisfaction being strongly related to ATT_{POS} but at best weakly related to ATT_{NEG}. The interaction effects (Step 3; columns 6-7) did not explain additional variance, R^2s < .01, *p*s > .15. Thus, life satisfaction was largely predicted by ATT_{POS}; adding non-linear terms to the model was unnecessary.

But then why did ATT_{AMB} predict Americans' life satisfaction? Analyzing positive and negative U.S. respondents separately reveals the answer. Among negative respondents, ATT_{AMB} related positively with life satisfaction (*r*s = .74 and .55 in the current and 2004 data, *p*s ≤ .005) because $ATT_{AMB} \approx ATT_{POS}$ (the *r* between ATT_{AMB} and ATT_{POS} was .99 in both data sets). The opposite was true for positive respondents. For them ATT_{AMB} related negatively with life satisfaction (*r*s = -.36 and -.32 in the current and 2004 data, *p*s < .005) because $ATT_{AMB} \approx ATT_{NEG}$ (the *r*s between ATT_{AMB} and ATT_{NEG} in both data sets were ≥ .98) and therefore also correlated negatively with ATT_{POS} (*r*s = -.74 and -.41). In sum, ATT_{AMB} predicted less satisfaction among positive respondents and more satisfaction among negative respondents, but since positive respondents predominated, averaging across the sample ATT_{AMB} predicted less satisfaction. In other words, ATT_{AMB} predicted life satisfaction in America not because of a direct causal connection between ATT_{AMB} and satisfaction, but because self-evaluative ambivalence was confounded with self-evaluative valence. In China, by contrast, ATT_{AMB} did not predict satisfaction largely because the ratio of positive to negative respondents was less extreme (3:1 versus 9:1 in America).

Discussion

The current study compared the traditional method with an alternative method for testing effects of potentially opposing attitudes in the context of predicting behavioral tendencies, conflicted feelings, culture, and life satisfaction.

Summary of Findings

With respect to predicting behavioral tendencies and life satisfaction, the unconstrained regression procedure consistently outperformed ATT_{AMB}, and showed that the optimal model included only first-order effects of ATT_{POS} and ATT_{NEG} and that including higher-order terms was unnecessary. Moreover, using ATT_{AMB} alone produced potentially misleading results. ATT_{AMB} predicted more undesirable behaviors, less desirable behaviors, and in America less life satisfaction, but only because ATT_{AMB} was confounded with attitude valence. Since $ATT_{AMB} \approx ATT_{NEG}$ for positive respondents and $ATT_{AMB} \approx ATT_{POS}$ for negative respondents, ATT_{AMB} correlates with ATT_{NEG} to the extent that positive respondents predominate and ATT_{POS} to the extent that negative respondents predominate. When the attitude object is the self or a desirable behavior such as exercising, positive respondents predominate, so ATT_{AMB} correlates with ATT_{NEG} and thus with outcomes associated with ATT_{NEG} (such as dissatisfaction or not exercising). Conversely, when the attitude object is a less desirable behavior such as cheating, negative respondents predominate, so ATT_{AMB} correlates with ATT_{POS} and thus with outcomes associated with ATT_{POS} (such as actually cheating).

ATT_{AMB} results were especially misleading for respondents whose attitudinal balance was in the minority. For example, when the attitude object was the self or a desirable behavior, greater ATT_{AMB} predicted less satisfaction and less behavior among the "majority" positive respondents (and thus in the sample as a whole), but predicted the exact opposite among the "minority" negative respondents. The reality was that satisfaction and behavior related positively to ATT_{POS} and negatively to ATT_{NEG} (for all respondents); the links between ATT_{AMB} and satisfaction or behavior were just artifacts of ATT_{AMB} being defined by positive respondents' ATT_{NEG} and negative respondents' ATT_{POS}.

The findings for conflicted feelings and culture were more complex. On the one hand, ATT_{AMB} sometimes predicted conflicted feelings or culture as efficiently or almost as efficiently as did the unconstrained regression model. On the other hand, even when that was true, the unconstrained model clarified which aspects of the ambivalence model were accurate versus misleading. For example, whereas the ambivalence model assumes that ATT_{BAL}*ATT_{NEG} and ATT_{BAL}*ATT_{POS} have equal but opposite effects, the unconstrained model showed that when predicting conflicted feelings about cheating ATT_{BAL}*ATT_{NEG} was significant but ATT_{BAL}*ATT_{POS} was not (indicating that ATT_{BAL} only moderated the influence of ATT_{NEG}), and when predicting culture ATT_{BAL}*ATT_{POS} was significant but ATT_{BAL}*ATT_{NEG} was not (indicating that ATT_{BAL} only moderated the influence of ATT_{POS}). As another example, whereas the ambivalence model assumes that stronger attitudes evoke more conflicted feelings, the unconstrained regression model showed that for widely shared attitudes (e.g., positive attitudes towards giving blood or negative attitudes towards cheating), stronger attitudes produced *less* conflicted feelings.

Broader Implications

The current paper focused on potentially conflicting positive and negative attitudes towards the same target—essentially, an approach-avoidance conflict. However, our method is equally applicable to approach-approach or avoidance-avoidance conflicts. For example, one could assess an approach-approach conflict about abortion by assessing the strength of "pro-life" attitudes (L) and "pro-choice" attitudes (C), and then predict an outcome (e.g., candidate preferences) as a function of L, C, ATT_{BAL} (i.e., whether L exceeds C or C exceeds L), ATT_{BAL}*L, and ATT_{BAL}*C.

Also, for simplicity we focused on the SIM formula, but our results and conclusions apply to any ambivalence formula. Studies have repeatedly found that all of the commonly used ambivalence formulas are, for practical purposes, interchangeable. For example, consider the three ambivalence indices employed by Spencer-Rodgers et al. (2004, Study 3): SIM, CRM, and the Gradual Threshold Model (GTM; Priester & Petty, 1996). In our data the *r*s between CRM and SIM, GTM and SIM, and CRM and GTM ranged from 0.96 to 1.00, and this was true regardless of whether the indices were computed on ratings of attitudes towards behaviors or on self-esteem ratings (and, in the latter case, was true in both the American and Chinese samples from both the current and 2004 data).

So, the problem is *not* the specific formula, and using a different formula will *not* solve the problem. The different formulas just offer different sets of assumptions about precisely how to weigh and juxtapose positive and negative attitudes. Embedding such assumptions a priori into an ambivalence index prevents us from testing how people actually do weigh and juxtapose positive and negative attitudes, and how those processes may vary depending on the target, the context, and so on. That is why we recommend using a hierarchical regression procedure that examines the effects of each component separately.

A possible counter-argument is that ambivalence explains the effects of ATT_{POS} and ATT_{NEG} rather than vice versa. The flaw in this argument is that ambivalence is defined both conceptually and mathematically as an interaction between ATT_{POS} or ATT_{NEG}, and so presupposes the existence of those components. Therefore, in no logical, causal, or statistical model can ambivalence be placed prior to its components. The same logic motivates the standard practice of testing lower-order effects prior to testing higher-order effects. Cohen et al. (2003) assert: “we would not look at effects in reverse order, for example, asking whether the linear

term contributes over and above the quadratic term, even if the quadratic relationship were expected" (p. 234).

Our critique does not apply to measures composed of homogeneous components, such as scales that use multiple items to assess one construct. For example, the current study aggregated the five negative RSES items into one scale because those items operationalize a single construct and show adequate internal reliability. Our concern is with measures composed of heterogeneous components.

The underlying ontological concern is that our models may juxtapose contents our subjects do not. For example, ambivalence formulas presume a dynamic interplay between positive and negative attitudes that people themselves may not actually experience. More generally, we can combine the disparate contents of social cognition into an indefinite number of “structural” variables, such as “ambivalence”, “self-consistency”, or “self-complexity”. However, these new variables may not refer to a unitary, causally efficacious, psychological property (Locke, 2003, 2006). A structural measure that claims to measure an emergent psychological property that is greater than its parts must prove this claim by showing it explains variance that its parts, separately, cannot.

The foundational principle is parsimony: Add complexity only if necessary. For example, to explain the effects of ATT_{POS} and ATT_{NEG} on conflicted *feelings* about drinking, including the moderating effects of ATT_{BAL} was necessary. However, to explain the effects of ATT_{POS} and ATT_{NEG} on drinking *behavior*, including moderating effects was unnecessary; the independent effects of ATT_{POS} and ATT_{NEG} were sufficient. In order for us to distinguish when complex variables are needed, we should treat them, not as reified units, but as interaction terms whose

place in our models depend on their giving us more information than the simpler components of which they are composed.

References

Armitage, C. J., & Conner, M. (2000). Attitudinal ambivalence: A test of three key hypotheses. *Personality and Social Psychology Bulletin, 26*, 1421–1432.

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied Multiple Regression - Correlation Analysis for the Behavioral Sciences.* Mahwah, NJ, USA: Lawrence Erlbaum Associates.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment, 49*, 71–75.

Edwards, J. R. (2002). Alternatives to difference scores: polynomial regression analysis and response surface methodology. In F. Drasgow & N. Schmitt (Eds.), *Measuring and analyzing behavior in organizations: Advances in measurement and data analysis* (pp. 350–400). San Francisco, CA: Jossey-Bass.

Faina, A, Costarelli, S., & Romoli, C. (2002). The effects of intergroup context of evaluation on ambivalence toward the ingroup and the outgroup. *European Journal of Social Psychology, 32*, 247–259;

Fong, C.T. (2006). The effects of emotional ambivalence on creativity. *Academy of Management Journal, 49*, 1016-1030.

Gray-Little, B., Williams, V. S., & Hancock, T. D. (1997). An item response theory analysis of the Rosenberg Self-Esteem Scale. *Personality and Social Psychology Bulletin, 23*, 443-451.

Heine, S. J., Lehman, D. R., Markus, H. R., & Kitayama, S.(1999). Is there a universal need for positive self-regard? *Psychological Review, 106*, 766-794.

Kachadourian, L.K., Fincham, F.D., & Davila, J. (2005). Attitudinal ambivalence, rumination and forgiveness of partner transgressions in marriage. *Personality and Social Psychology Bulletin, 31*, 334-342.

Locke, K. D. (2003). *H* as a measure of the complexity of social information processing. *Personality and Social Psychology Review, 7*, 268-280.

Locke, K. D. (2006). What predicts well-being: a consistent self-concept or a desirable self-concept? *Journal of Social and Clinical Psychology, 25*, 228-247.

Pavot, W. G., & Diener, E. (1993). Review of the Satisfaction With Life Scale. *Psychological Assessment, 5*, 164–172.

Priester, J. R., & Petty, R. E. (1996). The gradual threshold model of ambivalence: Relating the positive and negative bases of attitudes to subjective ambivalence. *Journal of Personality and Social Psychology*, 71, 431–49.

Riketta, M. & Ziegler, R. (2007). Self-ambivalence and reactions to success versus failure. *European Journal of Social Psychology, 37*, 547-560.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Rudolph, T. J., & Popp, E. (2007). An information processing theory of ambivalence. *Political Psychology, 28*, 563-585.

Spencer-Rodgers, J., Peng, K., Wang, L., & Hou, Y. (2004). Dialectical self-esteem and East-West differences in psychological well-being. *Personality and Social Psychology Bulletin, 30*, 1416-1432.

Thompson, M. M., Zanna, M. P., & Griffin, D. W. 1995. Let's not be indifferent about (attitudinal) ambivalence. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 361–386). Hillsdale, NJ: Erlbaum.

van Harreveld, F., van der Pligt, J., de Vries, N. K., Wenneker, C., & Verhue, D. (2004). Ambivalence and information integration in attitudinal judgment. *British Journal of Social Psychology, 43*, 431-447.

Zemborain, M. R., & Johar, G. V. (2007). Attitudinal ambivalence and openness to persuasion: a framework for interpersonal influence. *Journal of Consumer Research, 33*, 506-514.

Author Note

We thank Julie Spencer-Rodgers for being so generous with her time and data. Address correspondence to Kenneth Locke, Department of Psychology, University of Idaho, Moscow, ID, 83844; e-mail *klocke@uidaho.edu*.

Footnotes

[1] We used the following formula to test if an unconstrained model predicts more variance than ATT_{AMB}: $F = [(R_U^2 - R_A^2)/(k_U - k_A)]/[(1-R_U^2)/(n - k_U -1)]$, where R_U^2 = variance explained by the unconstrained model, R_A^2 = variance explained by ATT_{AMB}, n = sample size, k_U = number of predictors in the unconstrained model (i.e, 5), k_A = number of predictors in the ambivalence model (i.e, 1), and *F* has $(k_U - k_A)$ and $(n - k_U -1)$ degrees of freedom.

[2] The analytic procedure we recommend works with either unipolar or bipolar scales because the rationale for unipolar scales is not statistical, but conceptual—namely, that the low end of the scales should indicate indifference rather than opposition. However, regardless of the type of scale used, ATT_{POS} and ATT_{NEG} should *not* be centered because (unless ATT_{POS} and ATT_{NEG} have the same mean) this will change who is classified as a positive versus negative respondent.

[3] Spencer-Rodgers et al. (2004) used a slightly modified six-item version of the RSES.

Table 1

Behavioral Tendencies and Conflicted Feelings as a Function of Attitude Valence and Ambivalence

	ATT_{AMB}	ATT_{POS}	ATT_{NEG}	ATT_{BAL}	ATT_{BAL}* ATT_{POS}	ATT_{BAL}* ATT_{NEG}	Unconstrained – ATT_{AMB}
	β	β	β	β	β	β	ΔR^2
Behavioral Tendencies To…							
Exercise	-0.22**	0.32**	-0.11	-0.14	0.16	-0.18	0.09**
Low-Fat Diet	-0.25**	0.44**	-0.27**	-0.01	-0.00	0.18	0.27**
Giving Blood	-0.24**	0.30**	-0.23**	-0.17	0.11	0.08	0.14**
Television	0.06	0.32**	-0.20**	-0.42*	0.05	0.09	0.19**
Alcohol	0.17**	0.50**	-0.26**	-0.06	-0.09	-0.10	0.37**
Cheating	0.48**	0.41**	-0.31**	-0.14	-0.08	0.04	0.11**
Conflicted Feelings About…							
Exercise	0.27**	-0.25**	0.20**	0.22*	0.14	0.18	0.07**
Low-Fat Diet	0.26**	-0.03	0.15*	0.18	-0.29*	0.36**	0.01
Giving Blood	0.26**	-0.32**	0.17**	0.24	-0.29*	0.02	0.13**
Television	0.17**	0.01	0.14*	-0.32	-0.22	0.18	0.02
Alcohol	0.32**	0.14*	0.21**	-0.55**	-0.35*	0.37*	0.04*
Cheating	0.28**	0.21**	-0.13*	-0.23	0.02	0.37*	0.02

* $p < .05$, ** $p < .005$

Note. The ATT_{POS} and ATT_{NEG} coefficients are from Step 1 of the hierarchical regression, the ATT_{BAL} coefficients are from Step 2, and the interaction coefficients are from Step 3. All regression coefficients were standardized.

Table 2

Positive Self-Esteem as a Function of Culture and Self-Evaluative Balance

	Positive Respondents			Balanced Respondents			Negative Respondents		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Current Data									
U.S.	262	1.23	0.40	9	0.22	0.23	15	-0.08	0.57
China	99	0.94	0.44	9	0.42	0.23	18	0.07	0.40
2004 Data									
U.S.	85	5.94	0.64	5	4.70	0.45	25	3.98	1.08
China	105	5.30	0.62	6	4.71	0.29	42	3.98	0.92

Note. The values represent means and standard deviations of ratings on either -2 to +2 scales (in the current data) or 1 to 7 scales (in the 2004 data).

Table 3

Life Satisfaction as a Function of Valence and Ambivalence of Self-Evaluative Attitudes in the U.S. and China

	ATT_{AMB}	ATT_{POS}	ATT_{NEG}	ATT_{BAL}	ATT_{BAL}* ATT_{POS}	ATT_{BAL}* ATT_{NEG}	Unconstrained – ATT_{AMB}
	β	β	β	*B*	β	β	ΔR^2
U.S.							
Current Data	-0.41**	0.51**	-0.09	0.09	-0.21	-0.29	0.19**
2004 Data	-0.23*	0.62**	-0.15	0.10	0.33	-0.05	0.48**
China							
Current Data	-0.14	0.33**	-0.03	-0.03	0.11	0.02	0.10**
2004 Data	0.03	0.31**	-0.17*	-0.02	0.13	0.61	0.18**

* $p < .05$, ** $p < .005$

Note. ATT_{POS} and ATT_{NEG} were scores on, respectively, positive and negative RSES items. The ATT_{POS} and ATT_{NEG} coefficients are from Step 1 of the hierarchical regression, the ATT_{BAL} coefficients are from Step 2, and the interaction coefficients are from Step 3. All regression coefficients were standardized.

Figure Captions

Figure 1. Attitudinal similarity as a function of the inverse of the absolute difference between positive and negative attitudes (rated on a 0 to 1 scale). Darker shading indicates greater attitudinal similarity.

Figure 2. The CRM function. Attitudes rated on a 0 to 1 scale. Darker shading indicates greater ambivalence.

Figure 3. The SIM function. Attitudes rated on a 0 to 1 scale. Darker shading indicates greater ambivalence.

Figure 1

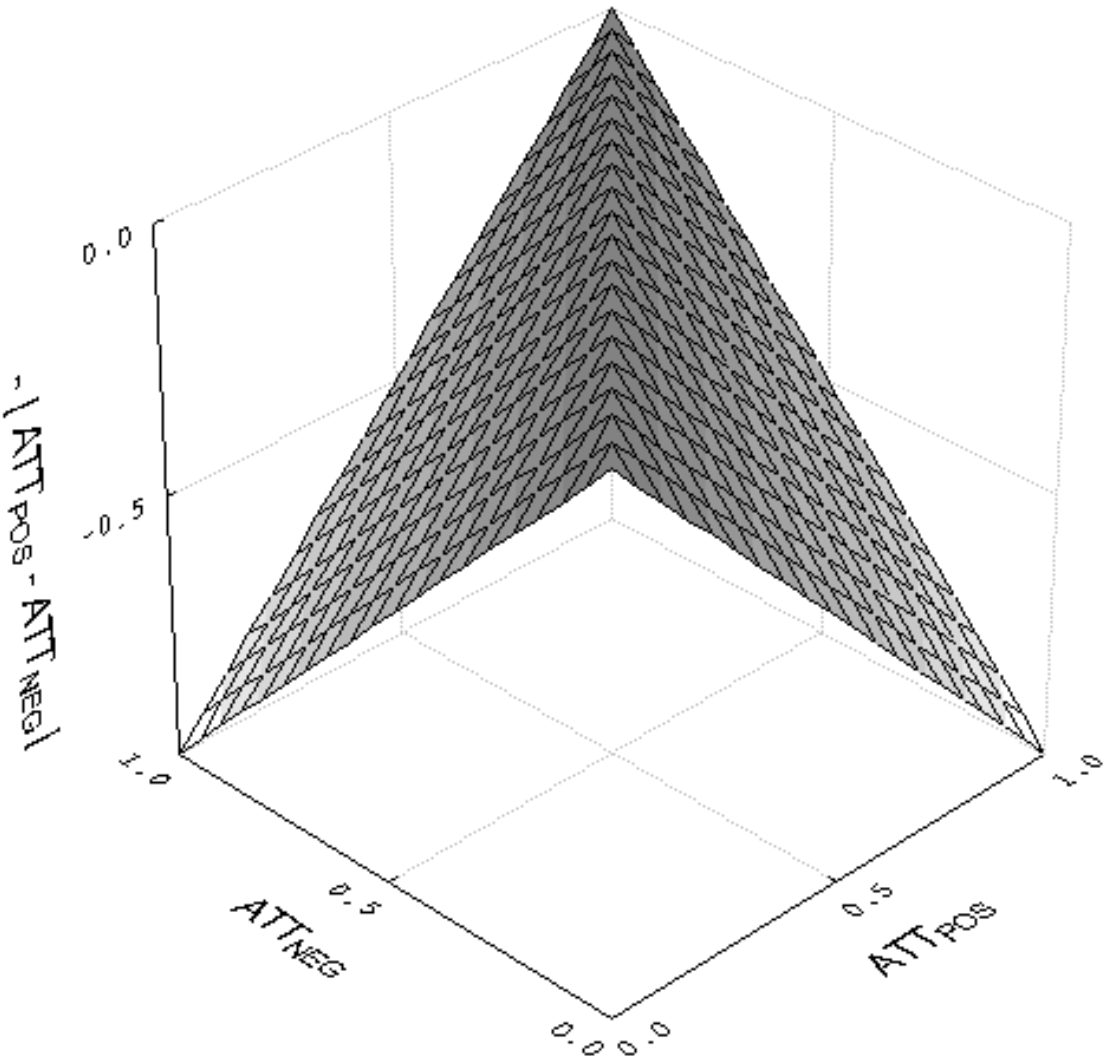

Figure 2

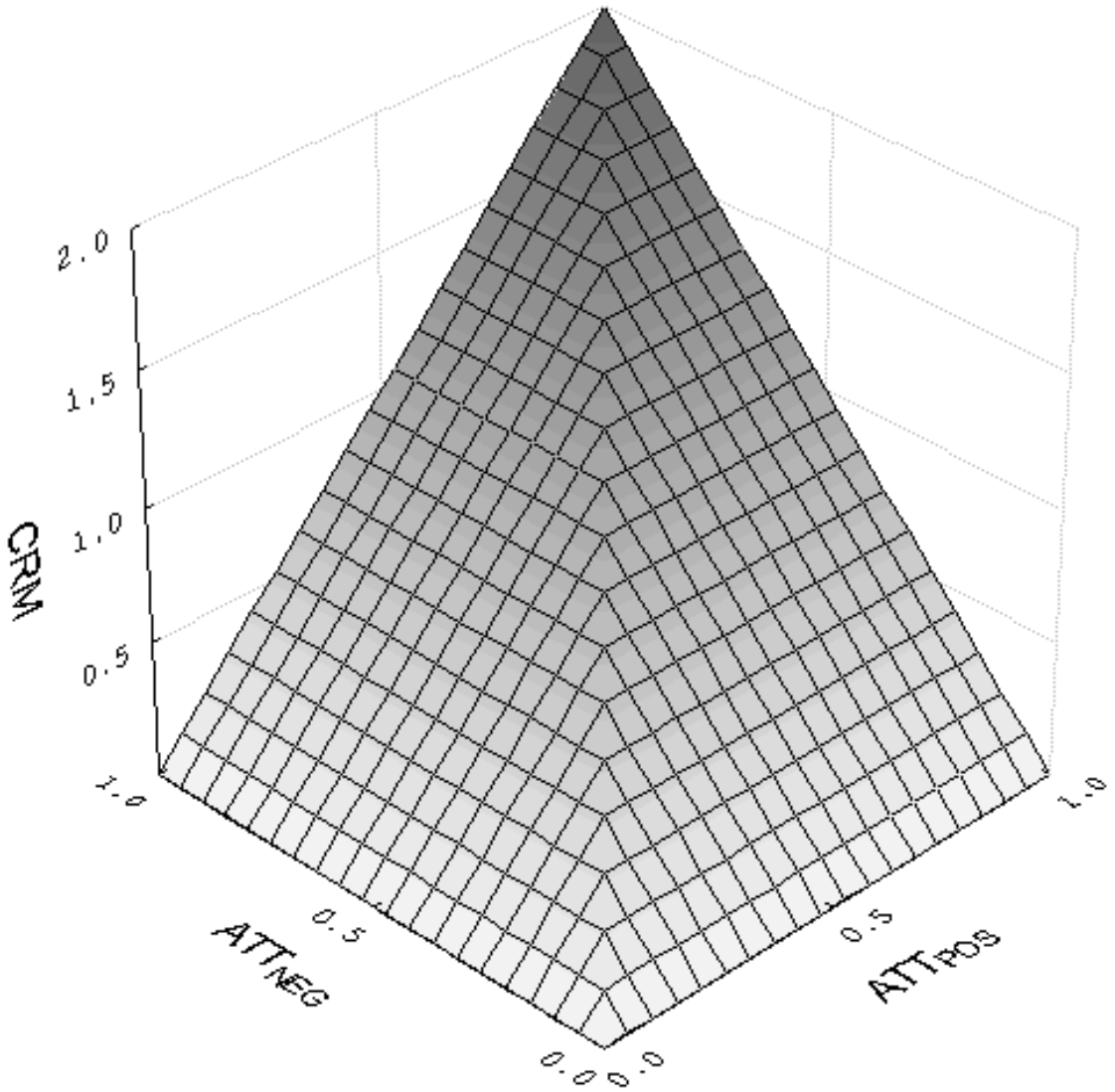

Figure 3