Implicit Interpersonal Evaluations as a Risk Factor for Suicidality: Automatic Spousal Attitudes Predict Changes in the Probability of Suicidal Thoughts

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Abstract

Thwarted social connection is a critical risk factor for suicidality, and several theoretical perspectives highlight the importance of interpersonal affect to social connection. Given that marriage is an increasingly important source of social connection, we examined the role of automatic spousal attitudes—conceptualized as spontaneously activated affective associations involving one's spouse—in predicting suicidal thoughts in three longitudinal studies of married couples. Studies 1a (*N*=204) and 1b (*N*=159) demonstrated that more positive automatic spousal attitudes, assessed implicitly shortly after the marriage as the speed with which people categorized positive relative to negative words following photo-primes of their spouse, were associated with a weakened probability of the self-reported suicidal thoughts one year later.Study 2 (*N*=229) provided further evidence that automatic spousal attitudes predict suicidal thoughts by showing that newly conditioned automatic spousal attitudes predicted suicidal thoughts. In that study, more positive automatic spousal attitudes exhibited after an evaluative conditioning procedure were associated with a reduced probability of suicidal thoughts two months later. Across studies, an increase (1 *SD*) in automatic spousal attitudes was associated with approximately a 50% decreased probability of suicidal thought. In all three studies, implicitly measured spousal attitudes captured variance in suicidal thoughts not captured by implicitly measured attitudes toward oneself and self-reported marital satisfaction, both of which proved to be less reliable predictors of suicidal thoughts. These findings highlight the importance of automatic interpersonal processes to well-being generally and suicidality specifically, and may thereby suggest novel methods for reducing risk of suicidality.

Keywords

Within the next 24 hours, well over 2,000 citizens of the world will die by suicide (World Health Organization, 2014). This toll is compounded by (a) the anguish that suicide decedents usually suffer leading up to their deaths, (b) the misery of bereaved family

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members and friends, numbering dozens per suicide (Cerel, 2015), and (c) the traumatic experience of first responders and passersby who encounter suicide death scenes, itself a common cause of Post-Traumatic Stress Disorder (Sveen & Walby, 2008). Critically, the foregoing is limited to suicide mortality and does not even consider the morbidity and other consequences of non-lethal suicide attempts, which are many times more common (e.g., Borges et al., 2010). Suicide mortality and morbidity thus constitute a grave public health emergency, and innovative approaches are clearly needed to understand suicidality in all its forms—including the desire to die by suicide and other suicidal thoughts.

It is worth emphasizing that our focus here is on such self-reported suicidal thoughts, and relatively mild suicidal thinking at that, as distinct from non-lethal suicidal behavior and from death by suicide. Above-zero suicidal thought is an important clinical phenomenon in its own right, a widely shared consensus view (e.g., Wenzel & Beck, 2008). Furthermore, mild suicidal thought may represent a region of a cohesive, underlying continuum of suicidality ranging from mild suicidal thought to death by suicide. Indeed, not only are these suicidal cognitions the most common form of suicidality, they are direct predictors of suicidal behavior (see Franklin et al., 2017). Accordingly, the study of any region of this spectrum may have relevance for understanding the spectrum as a whole. On the other hand, the spectrum may contain a discontinuity in its mid- to upper regions, a possibility that accords with ideation-to-action theoretical models of suicidal behavior (e.g., Klonsky & May, 2014), and with results suggesting that severe suicidality is a categorically distinct entity (e.g., Witte, Holm-Denoma, Zuromski, Gauthier, & Ruscio, 2017). In other words, though the current project has clear relevance to above-zero suicidal thought, its relevance to more severe forms of suicidality is indeterminate, a point to which we will return.

According to Joiner and colleagues' interpersonal theory (Joiner, 2005; Joiner, Van Orden, Witte, & Rudd, 2009; Van Orden et al., 2010), the desire to die by suicide stems from thwarted belongingness, one of three critical predictors of suicidality. In this model, thwarted belongingness interacts with the perception that one is burdensome to others to jointly predict the desire to die by suicide, and this interaction predicts lethal and near-lethal suicide attempts among people who have the sufficient capability to enact such attempts. This model builds upon prior theoretical work (e.g., Durkheim,1897/1963; Baumeister & Leary, 1995; Shneidman, 1985, 1998) to argue that thwarted social connection leads to a desire to die because it indicates a failure to meet a fundamental human need—the need to belong—a need Baumeister and Leary (1995, p. 520) argued can only be fulfilled with "frequent, affectively pleasant or positive interactions with the same individuals."

Empirical evidence confirms the critical role of thwarted belongingness in suicidality. Not only was social isolation the most common predictor of suicidality in Van Orden et al.'s (2010) review of studies predicting suicidality, the robustness of this association led those authors to conclude that "social isolation is arguably the strongest and most reliable predictor of suicidal ideation, attempts, and lethal suicidal behavior among samples varying in age, nationality, and clinical severity" (p. 579). Accordingly, the quality of important social connections likely figures prominently into decisions to end one's life.

Marriage as a Key Source of Social Connection

Marriage is likely to be critical in this regard. Over a century ago, the classic writings of Durkheim (1897/1963) highlighted the relevance of marriage to suicide, and recent theory suggests the relevance of marriage to suicide may have only increased since then. According to Finkel, Hui, Carswell, and Larson's (2014) suffocation of marriage model, today more than ever before, married people are relying on their spouse as their primary means of social connection. Compared to decades ago, for example, modern spouses have fewer friends (Amato et al., 2009), spend less time with the friends they do have (Dew, 2009), and socialize with people other than their spouses less frequently than their unmarried counterparts (Gerstel & Sarkisian, 2006).Perhaps as a result of these trends, Finkel et al. argue, the association between marital quality and subjective well-being appears to have become stronger over time (see Proulx, Helms, & Buehler, 2007). That is, just as people are increasingly relying on their spouses as their primary means of social connection, having a good marriage is becoming increasingly linked to better mental health whereas having a troubled marriage is becoming increasingly linked to poorer mental health.

Considered in light of the interpersonal theory, the growing importance of marriage to social connection highlights the potential importance of marital relationship quality to suicidality. People with high-quality marriages may experience enhanced social connection; for them, the most important cotemporary source of social connection is likely to offer the criteria Baumeister and Leary (1995) highlighted as critical to fulfilling the need to belong—frequent affectively pleasing interactions with the same individual. At the same time, this perspective suggests that people with low-quality marriages may experience thwarted belongingness that puts them at risk for suicidal thought; for them, the source of social connection that is primary in contemporary society may not offer pleasant interactions, and the importance society ascribes to this relationship likely limits alterative opportunities for this important aspect of social connection.

Consistent with these ideas, empirical evidence suggests marital quality is indeed linked to suicidality. Not only is divorce associated with an increased risk for suicidal thoughts and behaviors (Batterham et al., 2014; Høyer & Lund, 1993; Kposowa, 2000; Stack, 1990, Wyder, Ward, & De Leo, 2009), so are several indicators of poor relationship quality, such as interpersonal stress and conflict (e.g., Arcel, Mantonakis, Petersson, Jemos, & Kaliteraki, 1992; Bagge, Glenn & Lee, 2013; Choi et al., 2013; for review, see Kazan, Calear, & Batterham, 2016). For example, through in-depth interviews, Arcel et al. (1992) identified several relationship variables common among women who attempted suicide, such as low levels of intimacy and high levels of conflict and violence. Likewise, Bagge et al. (2013) interviewed survivors of suicide attempts and used a timeline follow-back procedure to detail the events that immediately preceded those attempts. Although initial analyses suggested several types of negative life events were associated with attempts (e.g., legal, financial, and health problems), it was only the negative interpersonal events involving a romantic partner that predicted a suicide attempt when all negative interpersonal events were considered together. Interpersonal conflict even appears to differentiate those who attempt suicide multiple times from those who attempt suicide for the first time. Choi et al. (2013) interviewed women who had survived a suicide attempt within the prior 48 hours and

reported that interpersonal conflict determined whether women had engaged in a previous attempt. In fact, almost 70% of the women who had engaged in a previous attempt specifically mentioned interpersonal conflict/stress as a precipitating factor, 90% reported having a conflictual (versus stable) social environment, and 85% noted feeling socially isolated.

Automatic Interpersonal Evaluations

Nevertheless, we know very little about the interpersonal cognitive processes involved in suicidality. Whereas the decision to actually end one's own life may require ample deliberation and thus cognitive resources (Joiner, 2005, 2014; Van Orden et al., 2010), the cognitive process by which the desire to die by suicide emerges in the first place may be more automatic (i.e., spontaneous and effortless; see Bryan, Rudd, Wertenberger, 2013; Chioqueta & Stiles, 2007; Nock & Banaji, 2007; Nock & Kazdin, 2002) and have affective properties (see Baumeister, 1990; Baumeister & Leary, 1995; Hendin, 1991; Joiner, 2005; Joiner et al., 2009; Van Orden et al., 2010; Zajonc, 1980). Indeed, affect has the capacity to automatically infuse even the most thoughtful of decisions across a wide variety of domains, including those relevant to attitude formation and change (Abelson, Kinder, Peters, & Fiske, 1982), judgment and decision making (Wyer, Clore, & Isbell, 1999), morality (Haidt, 2001), and romantic relationships (Clore & Byrne, 1974). Zajonc (1980, p. 172) may have been the first to highlight the relevance of automatic affective reactions to both marriage and suicide by concluding his classic article on the importance of such reactions this way:

> "People do not get married or divorced, commit murder or suicide, or lay down their lives for freedom upon a detailed cognitive analysis of the pros and cons of their actions. If we stop to consider just how much variance in the course of our lives is controlled by cognitive processes and how much by affect, and how much the one and the other influence the important outcomes in our lives, we cannot but agree that affective phenomena deserve far more attention than they have received from cognitive psychologists and a closer cognitive scrutiny from social psychologists."

Indeed, it seems quite likely that both marital troubles and a desire to die by suicide involve intense levels of negative affect that is activated that is activated spontaneously and without effort.

But the roles of spontaneous negative affect in marriage and suicide may be more linked even than this. Contemporary perspectives, including the interpersonal theory that guides our work, explicitly highlight the role of interpersonal sources of negative affect in suicide (Baumeister & Leary, 1995; Hendin, 1991; Joiner, 2005; Joiner et al., 2009; Van Orden et al., 2010). For example, Baumeister and Leary (1995, p. 497) repeatedly refer to affect in their seminal article on belongingness, a significant source of inspiration for the interpersonal theory, noting, for example, that belongingness involves "First, there is a need for frequent, affectively pleasant interactions with a few other people, and, second, these interactions must take place in the context of a temporally stable and enduring framework of affective concern for each other's welfare. Moreover, Van Orden et al. (2010) repeatedly highlighted the importance of affective responses while describing their interpersonal theory,

referring to loneliness as "an affectively laden cognition" and belongingness as "a dynamic cognitive–affective state" (p. 582).

Moreover, recent work on interpersonal social cognition highlights the automaticity of such affectively laden interpersonal evaluations by demonstrating that such evaluations not only develop automatically but, once developed, are activated automatically (see Hicks & McNulty, in press). Interdependence theory (Kelley & Thibaut, 1978), the predominant theory explaining how people evaluate their interpersonal relationships, posits that people evaluate the quality of their relationships by considering the sum total of their pleasant and unpleasant experiences with their partners, and subsequent theoretical advancements highlight interpersonal interactions as the most proximal of such experiences (Baumeister & Leary, 1995; Karney & Bradbury, 1995; Kelley et al., 1983). Of course, in line with Zajonc's (1980) reasoning, it is unlikely that people deliberatively process all their interpersonal experiences, consciously weighing the significance of each one before moving on to the next; it is likely that people have too many interpersonal experiences to do this. Instead, as they do in other domains (see Betsch, Plessner, Schwieren, & Gütig, 2001; Fazio, Lenn, & Effrein, 1984; Dijksterhuis & Nordgren, 2006), people likely automatically capture and continue to track the pleasantness of their interpersonal experiences in the form of summary evaluations—that is, *attitudes* toward their partners, defined as simple associations in memory between objects (e.g., one's partner) and affective associations (e.g., partner—good, Fazio, 2007; see also Gawronski & Bodenhausen, 2006; Smith & Nosek, 2011). Indeed, recent research indicates that these automatic partner attitudes capture people's pleasant and unpleasant interpersonal experiences with their partners better than do self-reported evaluations of the relationship (Murray, Holmes, & Pinkus, 2010; Hicks, McNulty, Meltzer, & Olson, 2016, 2018). For example, Murray et al. (2010) demonstrated that unpleasant experiences with a partner predicted more negative automatic partner attitudes but not self-reported relationship evaluations. Likewise, Hicks et al. (2016) demonstrated that pleasant interactions involving the partner, namely sexual behaviors, predicted more positive automatic partner attitudes but not self-reported evaluations of the partner or relationship.

What is particularly critical for the present purposes is that, as noted, these evaluative associations not only are formed automatically, but strong evaluative associations, such as those involving a spouse, are also activated automatically whenever one encounters the attitude object (Fazio, 2000; Fazio, Sanbonmatsu, Powell, Kardes, 1986; Gawronski & Bodenhausen, 2006).Accordingly, given the frequency with which one encounters a spouse, relatively negative automatic attitudes toward a spouse should serve as a frequent source of interpersonal negative affect that disrupts one's sense of social connection. After all, a large component of belongingness is "pleasant" interactions (see Baumeister & Leary, 1995) and continually experiencing negative affect in the presence one's spouse should reduce the extent to which people experience their interactions as pleasant. Consistent with this idea, several longitudinal studies demonstrate that automatic partner attitudes eventually predict changes in important indicators of social connection over time, including relationship satisfaction and relationship dissolution (e.g., Lee, Rogge, & Reis, 2010; McNulty, Olson, Meltzer, & Shaffer, 2013; McNulty, Olson, Jones, & Acosta, 2017; Scinta & Gable, 2007).

Motivated reasoning (Kunda, 1990) and other processes that limit self-insight (Nisbett & Wilson, 1977) can make some automatic attitudes elusive to measurement, however. Assessing automatic partner attitudes requires capturing the extent to which the partner activates positive and negative affect. But people can lack insight into the sources of their affect (Russell, 2003; Schachter & Singer, 1962; Schwarz & Clore, 1983), and the desire to perceive the partner and relationship in a positive light, which is ubiquitous (Fletcher & Kerr, 2010; Murray, 1999), may motivate people to attribute any negative affect associated with the partner to other sources.Indeed, automatic partner attitudes are rather weakly related to self-reported relationship satisfaction at any particular point in time (McNulty et al., 2013; Lee et al., 2010; Scinta & Gable, 2007), and sources of motivations to perceive the relationship positively appear to be part of what obscures this link (Scinta & Gable, 2007). It has become common for people to assess attitudes toward motivationally relevant targets with performance-based implicit measures (see Fazio & Olson, 2003). In particular, affective priming procedures (Fazio, Jackson, Dunton, & Williams, 1995; Payne, Cheng, Govorun, & Brandon, 2005) are specifically designed to capture the extent to which a specific stimulus activates positive versus negative affect by capitalizing on known qualities of information processing (see Fazio, 2007; Fazio & Olson, 2003). Consistent with the idea that such measure capture relatively affectively charged attitudes, they align more closely with self-reported attitudes when people are asked to report feelings versus beliefs (Kendrick & Olson, 2012; Smith & Nosek, 20011), and when participants provide explicit responses relatively quickly (Phillips & Olson, 2012).

The fact that automatic attitudes require implicit assessment should not be taken to suggest that they are unconscious and lack downstream consequences, however. It is possible for people to recognize the negative affect associated with a particular target without recognizing the source of that affect (see Gawronski, Hofmann, & Wilbur, 2006). This may explain why automatic partner attitudes are unrelated to self-reported relationship satisfaction concurrently yet eventually predict outcomes over time (McNulty et al., 2013; Lee et al., 2010; Scinta & Gable, 2007). Likewise, repeatedly experiencing negative affect during encounters with what is potentially a person's strongest source of social connection (Finkel et al., 2014) may disrupt social connection enough to predict the desire to die by suicide over time, regardless of whether people recognize that the partner is the source of negative affect. Put more simply, attitudes are automatic and thus efficient indicators of how objects make us feel, and consistently feeling negatively while in the presence of what is a critical source of social connection may be enough to prompt suicidal thoughts, even if people are initially unwilling or unable to recognize the source of those feelings.

Automatic Self-Attitudes

We would be remiss if we did not also mention the theoretical logic associated with the possibility that automatic affective associations involving oneself may predict suicidal thoughts. As noted earlier, the interpersonal theory posits that thwarted belongingness is one of two latent predictors of suicidality, with the other being perceived burdensomeness. The theory posits that burdensomeness is partly composed of affect-laden feelings of self-hate, which itself is a component of low-self-esteem. Likewise, following directly from the idea that the need to belong is a fundamental human need, sociometer theory (Leary &

Baumeister, 2000) posits that the function of self-esteem is to gauge one's own social standing, such that people respond to acceptance with increased self-esteem and respond to rejection with decreased self-esteem. Accordingly, self-esteem may also be a primary risk factor of suicide according to the interpersonal theory. Indeed, several studies have identified a link between low self-esteem and suicide (McGee, Williams, & Nada-Raja, 2001; Wilburn & Smith, 2005).

Of course, it is worth noting that Baumeister, Campbell, Krueger, and Vohs (2003) reviewed the self-esteem literature and concluded that there was no strong evidence that self-esteem exerts any causal effects, concluding that any associations involving self-esteem may be due to third variables or the reverse causal effects of various interpersonal circumstances, like rejection, on self-esteem. We are aware of no studies that have examined the association between self-esteem and suicide longitudinally, and thus the cross-sectional associations that have emerged may also reflect third variables or reverse causal associations in that suicidality predicts low self-esteem. We are also not aware of any studies examining the effects on suicidality of more automatic forms of self-esteem, such as those captured by implicit assessments. Just as people are motivated to perceive their relationships in a positive light, people are motivated to perceive themselves in a positive light (see Sedikides, 1993), and such motivations lead to deliberative self-evaluations that deviate from the more automatic, affectively laden ones captured by implicit measures (Olson, Fazio, & Hermann, 2007). And just as repeated activation of negative affect associated with a marital spouse may predict a stronger desire to die by suicide, so might repeated activation of negative affect associated with the self. Accordingly, we also examined whether automatic self-attitudes predicted the desire to die by suicide, but, more importantly in light of our primary focus, whether any effects of automatic partner attitudes were independent of any such effects.

Overview of the Current Studies

As we have reviewed, although interpersonal affect is theorized to be a key predictor of suicidality, the manner in which that interpersonally relevant affective information is organized and comes to predict suicidal thoughts is unclear. Along these lines, we propose that one automatic partner attitudes, which appear to be efficient, affective summaries of one's experience with a partner and that are activated automatically whenever one encounters the partner (see Hicks & McNulty, in press), predict suicidal thoughts. We addressed this issue with data drawn from three longitudinal studies of marriage. Studies 1a and 1b assessed automatic spousal attitudes and suicidal thoughts at baseline and then assessed suicidal thoughts with the same measure again one year later. Study 2 used data from an existing experimental study already known to successfully manipulate automatic spousal attitudes using evaluative conditioning (McNulty et al., 2017) to examine the implications of changes in automatic attitudes for suicidal thoughts over two months. We predicted that relatively negative automatic partner attitudes would be associated with an increased probability of suicidal thoughts over time.

Studies 1a and 1b

Method

Participants—Participants in Study 1a were drawn from 240 members of 120 (119 heterosexual) newlywed couples recruited from Northeast Florida. Recruitment involved sending letters to couples who applied for marriage licenses, posting fliers, and advertising via Facebook. As part of the broader goals of the study, eligibility required that all participants (a) had been married for fewer than three months, (b) were at least 18 years of age, and (c) spoke English (to ensure comprehension of questionnaires).

On average, husbands in Study 1a were 31.69 ($SD = 9.58$) years of age and had completed 15.94 ($SD = 2.52$) years of education. Seventy-one percent were employed full time and 21% were full-time students. The mean income they reported was $29,440 ($SD = $24,582) per year. Twenty-six percent of husbands had been married at least once before their current relationship. Wives were 29.75 ($SD = 7.97$) years of age and had completed 16.29 ($SD = 2.44$) years of education. Sixty-two percent were employed full time and 21% were full-time students. The mean income reported by wives was $29,642 ($SD = $50,237) per year. Twenty-two percent of wives had been married at least once before their current relationship. This sample was relatively representative in terms of race; 79% percent of husbands and 76% of wives self-identified as Caucasian, 12% of husbands and wives self-identified as Black or African American, 3% of husbands and 5% of wives self-identified as Hispanic or Latino/a, 1% of husbands and wives self-identified as Asian, and 5% of husbands and 6% of wives self-identified as another race/ethnicity. Couples had been together an average of 43.39 ($SD = 31.90$) months prior to marriage and 29% of the couples had children.

Participants in Study 1b were drawn from 135 heterosexual newlywed couples living in East Tennessee. Couples were recruited using two methods. The first was to place advertisements in community newspapers and bridal shops offering payment to couples willing to participate in a longitudinal study of newlyweds. The second was to send invitations to eligible couples who had completed marriage license applications in nearby counties. All couples responding to either method of solicitation were screened for eligibility in an initial telephone interview. Inclusion required that: (a) this was the first marriage for each partner, (b) the couple had been married less than six months, (c) each partner was at least 18 years of age, (d) each partner spoke English and had completed at least 10 years of education (to ensure comprehension of the questionnaires), and (e) couples did not yet have children and wives were not older than 35 (to allow a similar probability of transitioning to first parenthood for all couples, as part of broader aims of the study).

On average, husbands in Study 1b were 25.9 years old ($SD = 4.6$) and had completed 15.8 years ($SD = 2.5$) of education. Seventy percent were employed full time and 26% were full time students. Wives were 24.2 years old ($SD = 3.6$) and had completed 18.9 years ($SD = 2.3$) of education. Fifty-six percent were employed full time and 28% were full time students. The average combined income of couples was less than $40,000. The majority of husbands (91%) and wives (93%) identified as Caucasian.

Procedure—Both studies had similar procedures. After enrolling in each study, couples were either mailed a packet of surveys to complete at home and bring with them to a laboratory session or emailed a link to Qualtrics.com where they completed surveys online prior to their laboratory session. These surveys included a consent form approved by the local human subjects review board, three measures of global marital satisfaction, a question regarding the desire to die by suicide, additional measures beyond the scope of the current analyses, and a letter instructing spouses to complete their questionnaires independently of one another (though we could not confirm that couples did not consult one another). At their laboratory session, spouses were photographed from four angles while posing naturally, completed an implicit measure of their automatic spousal attitudes that utilized these photos, and also completed a variety of tasks beyond the scope of the current analyses. Couples were compensated $100 for completing the surveys and session.

Approximately one year subsequent to the initial laboratory session in both studies, couples were recontacted by phone or email and again sent a packet of survey questionnaires (via mail or email) that contained the same measure of the desire to die by suicide, a variety of measures beyond the scope of the current analyses, and a letter of instruction reminding spouses to complete the forms independently of one another. In Study 1a (but not Study 1b), couples again attended a laboratory session at this assessment where they completed a variety of tasks beyond the scope of the current analyses. Thus, couples were once again compensated $100 for completing the surveys and session in Study 1a and compensated $50 for completing each assessment in Study 1b. Given the similar procedures, we analyzed the studies separately and also analyzed the data combined from both to increase power.

Measures

Automatic spousal attitudes.: We measured automatic spousal attitudes at baseline of each study using the partner evaluative priming task (PEPT)—a recently developed partner-specific derivative of the evaluative priming task (Fazio et al., 1995; for other studies using this measure, see McNulty, Baker, & Olson, 2014; McNulty et al., 2013, McNulty et al., 2017; Hicks et al., 2016, 2018). This task was conducted in MediaLab and DirectRT and required participants to indicate as quickly as possible the valence of eight affectively charged positive target words (outstanding, charming, delightful, fabulous, likable, nice, excellent, wonderful) and eight affectively charged negative target words (sickening, awful, disturbing, horrible, irritating, disgusting, repulsive, rotten) after being exposed to primes of their spouses, themselves, and opposite-sex strangers. Combined with the evidence already reviewed that implicit measures such as the evaluative priming task capture attitudes that are primarily affective in nature in the first place (Kendrick & Olson, 2012; Phillip & Olson, 2012; Smith & Nosek, 2011), the fact that participants were required to categorize such affectively charged words, rather than concrete descriptors of relationship partners, such as "trustworthy" or "safe," lends confidence to the fact that our measure captured a primarily affective attitude toward the spouse, though we recognize this argument is debatable. The measure derived from the spouse primes is the primary focus of the current investigation and the measure derived from the self-primes is considered as a covariate; the measure derived from the stranger primes was not analyzed for this line of inquiry. Primes of the spouse and self were the four photos taken of each partner at the baseline session. All primes were

presented for 300 ms with no delay (i.e., stimulus onset asynchrony was 300 ms). The inter-trial internal was 1000 ms. Each participant first completed a baseline block that involved responding to each positive and negative word twice (32 trials) after seeing a neutral prime (a row of asterisks). This baseline practice block provides an index of individuals' reaction times (RTs) to the words themselves, which are known to be associated with several individual differences (see Unkelbach, Fiedler, Bayer, Stegmuller, & Bayer, 2008), which we accounted for in a variety of ways, as described below. Immediately following this block, participants completed two blocks of 48 trials each (each of the 8 positive and 8 negative target words following each of three priming categories). We assessed the RTs for participants to indicate the valence of the target words on all trials. Following common recommendations for data management (Wentura & Degner, 2010), we excluded (a) responses that were either slower than 2000 ms or faster than 300 ms and (b) responses that were inaccurate, the combination of which was 5.40% of the data in Study 1a and 5.44% of the data in Study 1b.

We operationalized automatic spousal attitudes in three ways, each accounting for RTs following neutral primes in a slightly different way.[1] Traditionally, researchers have accounted for RTs following neutral primes by calculating the difference between RTs to neutral primes and RTs to critical primes (see Fazio et al., 1995; Wentura & Degner, 2010; Wittenbrink, 2007). Such a difference can be conceptualized as a change in reaction time from the neutral to the critical prime, otherwise referred to as a facilitation score. Nevertheless, researchers have pointed out problems with using raw difference scores as a measure of change for decades (Chronbach & Furby, 1970; Edwards, 1994; Lord, 1956, 1967, Rogosa, Brandt, & Zimowski, 1982; Rogosa & Willet, 1983). One problem is that raw difference scores do not account for absolute levels of the variables in question, in this case the RTs themselves; that is, raw difference scores do not account for the fact that some people categorize words at a faster rate than others. Given difference scores are inherently correlated with their components (Edwards, 1994), the facilitation score may be correlated with such individual differences. For example, people who are unusually slow to indicate the positivity or negativity of a word may show a stronger or weaker facilitation. Some methodologists outside the domain of attitudes research have argued in favor of various forms of residualized difference scores (see Chronbach & Furby, 1970; Edwards, 1994; Lord, 1956, 1967). Prior work (McNulty et al., 2014; McNulty et al., 2013, McNulty et al., 2017; Hicks et al., 2016, 2018) has followed such recommendations by controlling for RTs to other primes, such a neutral primes, as a covariate. Our first operationalization used that approach. Specifically, we formed a single index of RTs following spouse primes by subtracting the average of the RTs to positive words following the spouse prime from the average of the RTs to negative words following the spouse prime; thus, higher scores indicate faster categorization of positive relative to negative words following the spouse prime. The critical covariate, which makes the RTs to spouse primes a residualized change score, was an equivalent index of RTs to the positive and negative words after the neutral prime during the orientation block.

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[1] Reviewers requested different operationalizations of the measure than we have typically employed. Rather than rely on one approach over another, we present several approaches to demonstrate the robustness of the effects to different operationalizations and minimal differences across approaches.

Our second operationalization used the facilitation score—the raw difference between RTs to neutral versus spouse primes. Specifically, we formed the difference between RTs to positive words following neutral versus spouse primes (RTs to positive, neutral - RTs to positive, spouse) and subtracted from it the difference between RTs to negative words following neutral versus spouse primes (RTs to negative, neutral - RTs to negative, spouse) [i.e., (RT positive, neutral – RT positive, spouse) – (RT negative, neutral – RT negative, spouse)]; thus higher scores indicate greater facilitation to positive words following spouse primes.

Our third operationalization is a combination of the two approaches. Specially, we used the facilitation score described above as the primary predictor but also controlled for the absolute level of RTs to both positive and negative words as a covariate. After considering all issues, this is our preferred approach because it capitalizes on the conceptual advantages of the facilitation score (estimating the difference between RTs to spouse versus neutral primes) and the empirical advantages of the residualized approach (controlling absolute levels of RTs to neutral primes).

We also formed equivalent indexes of response latencies to the positive and negative words after the self-primes for use as an alternative predictor / covariate. In cases of all spouse and self indices, we excluded differences that were more than 3 *SD*s from the mean. Descriptive statistics and reliability information for the facilitation scores, the more conceptually meaningful scores, are presented in Table 1.

<u>Suicidal Thoughts.:</u> Given the study was not originally designed to assess predictors of suicidality, we used one item assessing suicidal thought that was embedded in a measure of depressive symptoms, the Beck Depression Inventory II (Beck, Steer, & Brown, 1996). The specific item asked participants to indicate which of the following described their level of suicidal thought: "I don't have any thoughts of killing myself," "I have thoughts of killing myself, but I would not carry them out," "I would like to kill myself," "I would kill myself if I had the chance." Though single item measures of suicidality have practical limitations for clinical purposes, particularly with respect to their ability to detect prior suicidal behavior (Hom, Joiner, & Bernert, 2016), prior work has validated this single item as an effective research tool for understanding suicidality, including by demonstrating correlations with other established measures between $r = .70$ and $.80$ (e.g., Joiner, Gencoz, Gencoz, Metalsky, & Rudd, 2001; Metalsky & Joiner, 1997; see Joiner et al., 2005), and other prior work demonstrates this item predicts increased probability of death by suicide (Brown, Beck, Steer, & Grisham, 2000).Further, pilot work involving visitors to a university clinic indicated this single item was significantly associated with the probability of a prior suicide attempt, $r = .36$, $p < .001$ ($N = 637$), and depression, $r = .58$, $p < .001$ ($N = 736$). Given the limited variability in the magnitude of suicidal thought endorsed in each individual study, we dichotomized reports, such that no suicidal thought = 0 and any suicidal thought = 1.

<u>Self-reported marital satisfaction.:</u> In an effort to demonstrate the unique predictive validity of the implicit measure of spouse attitudes, we also measured participants' self-reported marital satisfaction using three established measures. One was the Quality Marriage Index (Norton, 1983), which contains six items that require participants to indicate the

extent of their agreement with general statements regarding the quality of their marriage. The second measure was a semantic differential (Osgood & Tannenbaum, 1957) that required participants to rate their perceptions of their relationship on 7-point scales between 15 pairs of opposing adjectives (e.g., "Dissatisfied-Satisfied"). The third measure was the Kansas Marital Satisfaction Scale (Schumm, 1986), which contains three items that require participants to indicate the extent of their agreement with general statements regarding the quality of their marriage. Internal consistency of all measures was high (coefficient alphas > .90). We standardized each measure and then averaged across the three of them to create an index of overall explicit marital satisfaction, with higher scores indicating higher satisfaction. We believe the high correlations among them (rs = .74 to .85), as well as the similarly high correlations observed in other research (see Funk & Rogge, 2007), justify this decision and demonstrate the validity of each measure as well as the index itself.

Additional Covariates.: Given known associations between suicide and age (e.g., Cutright & Fernquist, 2001) and, somewhat less reliably, education (e.g., Lorant et al., 2005), combined with the fact that each may be associated with performance on implicit measures, we controlled for participants' age and years of education in supplemental analyses.

Results

Of the 240 individuals in Study 1a, 1 wife did not complete the measure of suicidal thought at Time 1, and 14 husbands and 12 wives did not complete the measure of suicidal thought at Time 2. Of the remaining 213 individuals, 8 did not reliably complete the measure of automatic spousal attitudes at baseline (both members of one couple and one additional husband experienced technical difficulties; two husbands and three wives made errors on 20% or more of the trials). Additionally, one husband was more than 3 SDs from the mean on both attitude indexes and two additional husbands were more than 3 SDs from the mean on the attitude facilitation score. Accordingly, we were able to include 204 individuals for analyses involving the raw difference attitude measure and 202 individuals for analyses involving the facilitation score. These participants reported 29 (n = 15 among husbands, n = 14 among wives) instances of suicidal thought. To avoid excluding additional participants due to missing data in analyses involving the covariates, we replaced missing values on all covariates with the mean (n = 1 for age, n = 2 for education, n = 3 for self facilitation score).

Of the 270 individuals in Study 1a, 1 wife did not complete the measure of suicidal thought at Time 1 or Time 2, and 52 husbands and 48 wives did not complete the measure of suicidal thought at Time 2. Of the remaining 169 individuals, 5 husbands and 3 wives did not reliably complete the measure of automatic spousal attitudes at baseline (both members of one couple and 1 additional husband and wife experienced technical difficulties; 3 husbands and 1 wife made errors on 20% or more of the trials). Additionally, 2 wives were more than 3 SDs from the mean on the raw difference attitude measure and 1 husband and 1 wife were more than 3 SDs from the mean on the attitude facilitation score. Accordingly, we were able to include 159 individuals for analyses involving each of these measures. These participants reported 21 (n = 6 among husbands, n = 15 among wives) instances of suicidal thought. To avoid additional missing data in analyses involving the covariates, we replaced missing

values on all covariates with the mean (n = 3 for self difference, n = 2 for self facilitation score).

The primary analyses tested whether automatic spousal attitudes were associated with self-reported suicidal thought 1 year later. Given the data were drawn from couples, we used multilevel modeling to regress suicidal thought reported at Time 2 onto a random intercept, suicidal thought reported at Time 1, and each of our three operationalizations of spousal attitudes. Given the dichotomous nature of the outcome, we specified a Bernoulli sampling distribution. All tests of hypotheses used restricted maximum likelihood estimation and we interpreted the population average estimates with robust standard errors.

As can be seen in the first two sets of columns in Table 2, the spousal attitude index trended toward being negatively associated with suicidal thought reported at Time 2 in Study 1a and was significantly negatively associated with suicidal thought reported at Time 2 in Study 1b for all three operationalizations of the automatic spousal attitude measure. That is, spouses who demonstrated more positive automatic spousal attitudes demonstrated a decreased probability of reporting any suicidal thought 1 year later, and significantly so in Study 1b. Further, as can also be seen in Table 2, the association remained significant in Study 1b controlling age, education, self-reported marital satisfaction, and automatic self-attitudes, though it weakened somewhat in both studies.

The effects of other variables were less consistent. Age tended to be negatively associated with suicidal thought at Time 2 in Study 1a, but not Study 1b. Education, and less reliably self- reported marital satisfaction, tended to be negatively associated with suicidal thought at Time 2 in Study 1b, but not Study 1a. Automatic self-attitudes were negatively associated with suicidal thought at Time 2, but only when the RTs to positive and negative words following neutral primes were controlled, suggesting those RTs may be suppressing that association. All in all, however, these other factors revealed less consistent patterns than the automatic spousal attitudes.

We also conducted supplemental analyses that tested whether the separate positive and negative facilitation scores (RTs to categorize positive words after the neutral primes minus RTs to categorize positive words after the spouse primes and RTs to negative words after the neutral primes minus RTs to negative words after the spouse primes) were independently associated with suicidal thought at Time 2, controlling for suicidal thought at Time 1 and the RTs to categorize positive and negative words after the neutral primes. In Study 1a, neither the positive, $b = 0.22$, $SE = 0.40$, $t(87) = 0.55$, $p = .584$, $OR = 1.25$, nor the negative, $b = 0.64$, $SE = 0.46$, $t(87) = 1.38$, $p = .170$, $OR = 1.90$, facilitation scores were significantly associated with suicidal thought at Time 2. In Study 1b, the positive facilitation score was negatively associated with Time 2 suicidal thought, $b = -2.54$, $SE = 0.49$, $t(66) = -5.22$, $p < .001$, $OR = 0.08$, indicating that the extent to which the spouse prime facilitated the categorization of positive words predicted a lower likelihood of suicidal thought at Time 2. Controlling this, the negative facilitation score was positively associated with Time 2 suicidal thought, $b = 1.99$, $SE = 0.65$, $t(66) = 3.05$, $p = .003$, $OR = 7.30$, indicating that the extent to which the spouse prime facilitated the categorization of negative words predicted a greater likelihood of suicidal thought at Time 2.

Integrative Data Analysis—Given the weak association obtained in Study 1a, combined with concern over infrequent reporting of suicidal thought, we also conducted an integrative data analysis (Curran & Hussong, 2009) of all 50 reports of suicidal thought for up to 363 participants across Studies 1a and 1b. Specifically, we restandardized the raw scores across studies, again deleting attitude indices that were more than 3 *SD*s from the mean (which ultimately resulted in us retaining the same scores as in the individual analysis), and conducted the same analyses as in the individual studies with the exception that we also entered a dummy code to control for idiosyncratic differences between the studies.

As can be seen in the last set of columns in Table 2, the results of these analyses also suggested automatic spousal attitudes were associated with suicidal thought at Time 2. This association was significant for all operationalizations of automatic spousal attitudes in the analysis that did not include covariates, and remained significant controlling for additional covariates in the two analyses involving the facilitation attitude score, though it only trended toward significance when controlling the additional covariates in the analysis that involved that raw difference attitude index.

The integrative data analysis also helped offer some clarity regarding the sporadic associations involving covariates that emerged across the two studies. Once all data from both studies were considered, only self-reported marital satisfaction demonstrated any reliable association with Time 2 suicidal thought, and even this association was only trending toward significance across the different analyses.

We also again tested whether the separate positive and negative facilitation scores were independently associated with suicidal thought at Time 2, controlling for the RTs to categorize positive and negative words after the neutral primes. In this analysis, the association between the positive facilitation score and suicidal thought at Time 2 did not reach significance, $b = -0.36$, $SE = 0.41$, $t(160) = -0.88$, $p = .382$, $OR = 0.70$. Nevertheless, the negative facilitation score was once again positively associated with suicidal thought at Time 2, $b = 0.86$, $SE = 0.43$, $t(160) = 1.98$, $p = .049$, $OR = 2.35$, indicating that the extent to which the spouse prime facilitated the categorization of negative words predicted a greater likelihood of suicidal thought at Time 2.

Study 1 Discussion

Study 1 provided preliminary evidence that one's immediate gut-level affective responses to a marital partner predict suicidal thought over time. Consistent with the critical role of marriage to social connection (Finkel et al., 2014) and the critical role of social connection to suicidality (Joiner, 2005; Van Orden et al., 2010), individuals with relatively more negative automatic spousal attitudes at baseline (versus relatively more positive partner attitudes) demonstrated stronger increases in their levels of suicidal thought across the first year of marriage. That is, being relatively slower to categorize positive words and faster to categorize negative words after being primed with images of one's spouse was associated with steeper increases in probability of suicidal thought over the first year of marriage. Though this association only trended toward significance in Study 1a, it was significant in Study 1b and the integrative data analysis that pooled the data from the two studies.

Study 2

Study 2 sought to provide additional evidence for the link between automatic spousal attitudes and suicidal thought using a study specifically designed to directly target the positivity of automatic spousal attitudes. A previous article (McNulty et al., 2017) described the success of the evaluative conditioning manipulation (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010; Jones, Olson, & Fazio, 2010)—married couples randomly assigned to undergo 13 evaluative conditioning sessions in which the partner was paired with pleasant stimuli demonstrated more positive automatic spousal attitudes than a control group that viewed the partner paired with neutral stimuli. We took advantage of the success of this manipulation to examine whether the increases in automatic spousal attitudes, assessed with the same implicit measure used in Study 1a and Study 1b, predicted a decreased probability of suicidal thought, which was measured before the manipulation and two months later using a better measure of suicidal thought.

Method

Participants

Participants were 288 members of 144 heterosexual married couples recruited from the local community. Given priorities of our funding agency, eligibility required that participants be married less than 5 years and under the age of 40. Husbands were 28.72 ($SD = 4.38$) years of age, had completed 16.34 ($SD = 2.35$) years of education, and earned \$36,190 ($SD = 24,819$) annually. Wives were 27.87 ($SD = 4.70$) years of age, had completed 16.98 ($SD = 2.04$) years of education, and earned \$32,278 ($SD = 26,164$) annually. This sample was relatively representative in terms of diversity, with 73% of husbands and 78% of wives self-identified as Caucasian; 13% of husbands and 9% of wives reported having been married previously and 42% of couples reported having children.

Procedure

Prior to randomization, both members of the couples completed a well-validated measure suicidal thought and three standard measures of explicit relationship satisfaction online. At a lab session several days later, but also before randomization, both members of the couples were photographed from nine different perspectives (five smiling, four with an expression of their choice) and then completed an evaluative priming measure of their automatic spousal attitudes using the same measure used in Study 1. Next, couples completed an evaluative conditioning (EC) session in the lab and were instructed to separately complete the same EC procedure online at home once every three days for six weeks. On the day of a conditioning session, each member of the couple was emailed a separate link to the procedure and instructed to complete it before noon the next day. Couple members were also instructed to separately complete the same evaluative priming assessment of their automatic spousal attitudes and the same measures of explicit marital satisfaction online once every two weeks for the next eight weeks. The final assessment also included the same measure of suicidality used at baseline. Links to these assessments were included in emails that were sent separately from the emails containing links to the EC sessions. Couples were paid \$50 for

the initial lab sessions, $5 for each EC session each partner completed, and $15 for each follow-up assessment each partner completed.

Measures

Manipulation of automatic spousal attitudes.—Each evaluative conditioning session required each participant to separately view a stream of images and words on a computer monitor and to press the space bar whenever a pre-specified target image appeared. Searching for the target served to maintain participants' attention. Embedded in the stream of stimuli were critical pairings of photos of the spouse (CS) and various US images (e.g., a puppy, a sunset) and words (e.g., "wonderful," "fabulous"). As reported in the original article, each evaluative-conditioning session consisted of five blocks, each one consisting of 45 trials, including 5 critical pairings of the partner with a US. Approximately half of the targets, fillers, and USs were words, and half were images. To ensure that participants did not habituate to the USs, we selected 75 USs (39 images, 36 words) and distributed them randomly across the 13 sessions. Targets varied from session to session. All stimuli appeared for 1500 ms each. The inter-trial interval was 1000 ms, except before and after critical pairings when it was 2000 ms to help break up monotony and thereby facilitate encoding. Based on random assignment of couples to condition, participants in the experimental condition always viewed photos of the spouse paired with positive stimuli and participants in the control condition always viewed photos of the spouse paired with neutral stimuli. Sessions took approximately 6–7 min. each to complete. This procedure was implemented using Inquisit Web 4.0. (For additional details, see McNulty et al., 2017.)

Automatic attitudes.—We measured automatic spousal and self-attitudes using the same implicit measure and exclusion criteria used in Study 1, but this time we used Inquisit Web 4.0 to facilitate online data collection. The same words and photos were used across all assessments. As in Studies 1a and 1b, only a small proportion of the responses was over 2000 ms (5.16%). Descriptive statistics and reliabilities for the facilitation score at each assessment are presented in Table 3 and correlations among the two-week assessments appear in Table 4. The correlations reveal that individual components of the attitude index were correlated across the two-week intervals, though the correlations among the difference score index were weaker. We scored the measure the same ways as in Studies 1a and 1b and averaged across the four follow-up assessments (those occurring after the start of the evaluative conditioning procedure) for the primary analyses.

Suicidal thoughts.—We assessed suicidal thoughts using the Suicidality Subscale of the Depressive Symptom Index (Metalsky & Joiner, 1997), a well-validated measure that assesses the frequency and controllability of suicidal thoughts as agreement with four sets of four statements that increase in severity (e.g., "I do not have thoughts of killing myself," "Sometimes I have thoughts of killing myself," "Most of the time I have thoughts of killing myself," "I always have thoughts of killing myself"). Each set of response options was scored from 0 (no thoughts of suicide) to 3 (most severe thoughts of suicide) and scores across the four response sets were summed; thus, scores on the index could range from 0 to 12. Participants completed the instrument online at baseline before the evaluative conditioning intervention and online again at the end of the study. Coefficient alpha was .81

at baseline and .93 at follow-up. Pilot work involving the same clinic attendees described in the methods of Study 1a and Study 1b indicated this scale was associated with the probability of a prior suicide attempt, $r = .32$, $p < .001$ ($N = 617$), and depression, $r = .52$, $p < .001$ ($N = 713$). The scale was also recently validated against six a priori criteria (e.g., thwarted belongingness, prior suicide attempt) by an independent research group (Batterham et al., 2015). The brief nature of this scale makes it ideal for use when it is critical to minimize participant burden, such as within longitudinal designs (see Joiner, Pfaff, & Acres, 2002). We once again report analyses based on the same categorical coding used in Study 1a and 1b as the primary analyses.

Explicit marital satisfaction.—We used the same three explicit marital satisfaction measures used in Study 1 (coefficient alphas > .90; rs = .83 −.91) to create an index of overall explicit marital satisfaction.

Additional Covariates.—We once again also controlled for age and years of education in supplemental analyses.

Results

Of the 288 individuals who began the study, 2 husbands and 6 wives did not complete the measure of suicidal thought at Time 1, and 23 husbands and 25 wives did not complete the measure of suicidal thought at Time 2. Of the remaining 232 participants, 229 completed the baseline and at least one follow-up assessment of automatic spousal attitudes that led to valid calculations of the facilitation score (three husbands were more than 3 SDs from the mean on the facilitation score), and 228 completed the baseline and at least one follow-up assessment of automatic spousal attitudes that led to valid calculations of the raw attitude difference index (four husbands were more than 3 SDs from the mean on the raw difference index). These participants reported 20 (n = 12 among husbands, n = 8 among wives) instances of suicidal thought, most of which were relatively mild (on the scale that ranged from 0 to 12, eight people scored a 1, three people scored a 2, three people scored a 3, four people scored a 4, one person scored a 6, and one person scored a 7). To again avoid additional missing data in analyses involving the covariates, we replaced missing values on all covariates with the mean (n = 2 for self-reported marital satisfaction, n = 7 for age, n = 2 for self facilitation score).

The primary analyses were similar to those employed in Studies 1a and 1b. Specifically, we used multilevel modeling to regress suicidal thought reported at Time 2 onto a random intercept, suicidal thought reported at Time 1, and the mean of the automatic spousal attitudes exhibited across the four follow-up assessments, using each of our three operationalizations of spousal attitudes. Further, to help ensure the effects were unique to the newly conditioned attitude, rather than other relationship factors, we controlled for the automatic spousal attitude exhibited before the manipulation at baseline, as well as the manipulation itself (and the RTs exhibited at baseline that served as necessary covariates for each operationalization). Given the dichotomous nature of the outcome, we again specified a Bernoulli sampling distribution. All tests of hypotheses used restricted maximum likelihood estimation and we interpreted the population average estimates with robust standard errors.

Results are reported in Table 5. Consistent with predictions and the findings of Studies 1a and 1b, post-manipulation changes in participants' automatic spousal evaluations were associated with a decreased probability of suicidal thoughts two months later according to all three operationalizations of the automatic spousal attitude. That is, spouses who demonstrated more positive automatic spousal attitudes after the manipulation saw steeper decreases in the probability of suicidal thoughts over the two months of the study. Further, as can also be seen in Table 5, the association remained significant controlling age, education, self-reported marital satisfaction, and automatic self-attitudes in all three analyses. Of these covariates, only education was associated with suicidal thought at Time 2, such that participants with less education demonstrated an increased probability of suicidal thought.

Finally, we again conducted a supplemental analysis that tested whether the separate positive and negative facilitation scores were independently associated with suicidal thought at Time 2, controlling for suicidal thought at Time 1 and the RTs to categorize positive and negative words after the neutral primes as well as the positive and negative facilitation scores at baseline and corresponding RTs to categorize positive and negative words after neutral primes at baseline. In this analysis, the association between the positive facilitation score and suicidal thought did not reach significance, $b = -0.07$, $SE = 0.15$, $t(90) = -0.48$, $p = .636$, $OR = 0.93$. Nevertheless, the negative facilitation score was once again positively associated with suicidal thought at Time 2, $b = 0.97$, $SE = 0.29$, $t(90) = 3.33$, $p = .001$, $OR = 2.64$, indicating that the extent to which the spouse prime facilitated the categorization of negative words predicted a greater likelihood of suicidal thought at Time 2.

Study 2 Discussion

Study 2 provided additional evidence that more positive automatic spousal attitudes predict an reduced probability of suicidal thought. In this study, more positive automatic attitudes exhibited after an evaluative conditioning procedure that increased those attitudes predicted reporting less suicidal thought, controlling initial suicidal thought and initial automatic partner attitudes. This effect emerged across all three operationalizations of automatic spousal attitudes, both controlling and not controlling self-reported marital satisfaction, age, education, and automatic self-attitudes.

Integrative Data Analysis

Although automatic partner attitudes demonstrated consistent significant associations with subsequent suicidal thought in Study 1b and Study 2, both controlling and not controlling covariates, these studies were based on a limited number of instances of suicidal thought and the association that emerged in Study 1a did not reach traditional levels of significance. The integrative data analysis of Studies 1a and 1b provided some evidence of the robustness of the association, but we conducted one more integrative analysis of all three studies. We began by restandardizing the raw scores of all variables across the three studies, which resulted in us excluding 5 husbands and 2 wives from analyses involving the facilitation attitude score (who were more than 3 SDs from the mean on that variable) and 5 husbands and 9 wives from analyses involving the non-facilitation attitude score (who were more than 3 SDs from the mean on that variable). Thus, our analyses were based on 70 (n = 34 for

husbands and n = 36 for wives) instances of suicidal thought from 591 people using the facilitation score and 68 (n = 34 for husbands and n = 34 for wives) instances of suicidal thought from 584 people using the non- facilitation score.

Next, using the same analysis strategy as in the in individual studies, we regressed reports of suicidal thought at Time 2 onto suicidal thought at Time 1 and each attitude index. Results are reported in Table 6. As can be seen, automatic partner attitudes were negatively associated with changes in the probability of suicidal thought in all three analyses. Further, this association remained significant in all three analyses after controlling for self-reported marital satisfaction, age, education, and automatic self-attitudes. None of these covariates were reliably associated with subsequent suicidal thought, although the association between self-reported marital satisfaction and subsequent thought was trending toward significance.

We also again examined whether positive and negative facilitation scores were independently associated with Time 2 suicidal thought, controlling for the RTs to categorize positive and negative words after the neutral primes. In this analysis, the association between the positive facilitation score and suicidal thought at Time 2 did not reach significance, $b = -0.28$, $SE = 0.35$, $t(254) = -0.79$, $p = .431$, $OR = 0.76$. Nevertheless, the negative facilitation score trended toward being positively associated with suicidal thought at Time 2, $b = 0.71$, $SE = 0.37$, $t(254) = 1.92$, $p = .056$, $OR = 2.02$, indicating that the extent to which the spouse prime facilitated the categorization of negative words predicted a greater likelihood of suicidal thought reported at Time 2.

Given the increased sample size of this analysis, we also examined several interactive effects not examined in the analyses of the individual data sets. First, we examined whether the association between automatic spousal attitudes and Time 2 thought was moderated by sex, using our preferred measure of spousal attitudes, the facilitation score difference controlling for the RTs to categorize positive and negative words after the neutral primes. Sex did not moderate the association in this analysis, $b = 0.01$, $SE = 0.42$, $t(270) = 0.01$, $p = .990$, $OR = 0.76$. We also examined whether the positive and negative facilitation scores interacted to predict Time 2 thought, controlling for the RTs to categorize positive and negative words after the neutral primes. The positive and negative facilitation scores did not interact to predict suicidal thought at Time 2, $b = -0.27$, $SE = 0.25$, $t(253) = -1.06$, $p = .289$, $OR = 0.77$.

General Discussion

In the current research, we built upon the writings of several luminaries, including Durkheim (1897), Zajonc (1980), and Baumeister and Leary (1995), to predict and demonstrate that automatically activated affective associations involving a marital spouse are an important predictor of subsequent suicidal thought. Specifically, through a novel melding of Joiner and colleagues' interpersonal theory of suicide (Joiner, 2005; Joiner et al., 2009; Van Orden et al., 2010), Finkel and colleagues' (2014) suffocation model of marriage, and dual process models of interpersonal cognition (e.g., Fazio & Olson, 2014; Gawronski & Bodenhausen, 2006), we arrived at the prediction that more negative automatic spousal attitudes would predict a relatively greater probability of suicidal thought over time. We then supported this

prediction using three longitudinal studies, showing that the speed with which married people were able to categorize positive and negative words after being primed with photos of their spouses—an index of the extent to which they associate those spouses with positive versus negative affect—was consistently predictive of subsequent suicidality. Further, these implicitly-measured attitudes captured variance in suicidal thought not captured by spouses' explicit marital satisfaction or implicitly assessed evaluations of themselves. Although prior research has demonstrated links between self-reports of relationship quality and suicidality (see Kazan et al., 2016), that research has tended to show associations between suicidality and self-reported relationship quality measured concurrently. What is novel about the current findings is that the implicit interpersonal assessment was more reliably associated with changes in the probability of suicidal thought over time than was the explicit assessment.

These findings should be considered in light of several limitations. First, Studies 1a and 1b were based on a single item measure of the desire to die by suicide. Although it is impressive that the implicit measures predicted variability in even these single-item measures, and although Study 2 was a successful conceptual replication that involved a four-item measure of suicidal thought, future research may benefit from using broader measures that offer more nuance, as well as from examining suicidal behavior.

Second, although the reliability was adequate for the RTs to positive and negative words as separate indices, it was less than ideal when we considered the difference between those two indices (i.e., the attitude index itself). Nevertheless, we are somewhat comforted by the fact that the difference between the RTs to positive and negative words is conceptually appropriate (see Greenwald et al., 1998; Fazio et al., 1995; Fazio & Olson, 2003; Payne et al., 2005; Wentura & Degner, 2010) and was consistently predictive of subsequent suicidal thought. We are also somewhat comforted that psychometricians have argued that measures can demonstrate meaningful and consistent predictive validity despite low reliability (e.g., Overall & Woodward, 1975, 1976; Nicewander & Price, 1978). Specifically addressing this issue with respect to implicit measures, Schryver et al. (2016, no pagination) recently argued that "there is no direct or one-to-one mathematical relationship between the reliability of an implicit measure and the likelihood of replicating an experimental outcome. Random measurement error and reliability refer to two very different psychometric concepts that cannot be used interchangeably."

Also regarding the implicit measure, a third limitation is that the our contrast category, RTs to positive and negative words after being primed with a row of asterisks, is somewhat arbitrary. Indeed, one may argue that there is almost never any "neutral" prime in evaluative priming. Researchers typically compare reactions to puppies versus cockroaches, black people versus white people, democrats versus republicans, etc. (see Fazio & Olson, 2003). Such comparisons provide an indicator of relative preference, which has intuitive appeal for object pairs that are natural contrasts (e.g., a more favorable view of white people can imply a less favorable view of black people). However, this approach becomes problematic when the focal object has no natural or obvious contrast, such as with one's spouse. Possible animate comparisons include strangers, friends, relatives, and the self, but each offers a different conceptual interpretation of the attitude index, and none that seemed particularly critical for suicidal thought. Does one really need to feel more positively toward one's

spouse than one feels toward family, friends, the self, or even strangers in order to be protected from suicidal thought? We do not think so, because positive affect toward all of these stimuli may protect one from suicidal thought. Thus, we instead attempted to capture affect associated with the spouse as generally as possible, using the RTs to the most neutral stimuli available to us. Nevertheless, researchers moving forward should consider carefully whether using a contrast category is conceptually meaningful, and, if so, what contrast category is most appropriate.

Fourth, these findings are based on samples that were limited in a number of ways. For instance, given that marriage is easy to define and a key source of social connection, we focused on people who were legally married. This choice eliminated from consideration other strong sources of social connection, such as those who choose not to marry and many same-sex couples (given most participants in these studies were married before recent changes to same-sex marriage laws), as well as sources of non-romantic social connection. Likewise, although the samples in Study 1a and Study 2 contained some variability in race, the sample examined in Study 1b was relatively White, and most couples were also young, with the average age of all samples being around 30 years of age. Finally, and perhaps most importantly, these couple members demonstrated relatively low rates of suicidal thought and the suicidal thought they did demonstrate was mostly mild. Given that mild suicidal thought and severe suicidality may be categorically distinct entities (e.g., Witte et al., 2017), it is not known whether these effects would extend to individuals more at risk for suicidality. For all of these reasons, generalizations of these findings to other samples should thus be made with caution until future research can extend these findings to other samples, particularly those suffering from severe suicidality.

These limitations notwithstanding, the current work has important theoretical implications. First, the fact that people's spontaneous, automatic reactions to their spouses predicted even mild suicidal thought, independent of their deliberative, self-reported evaluations of their relationships, suggests automatic interpersonal processes may be a critical factor thus far unrecognized as relevant to suicidality, particularly if mild suicidal thought is on the same conceptual continuum as suicidal behavior. In fact, although automatic self-reactions appeared unrelated to suicidal thought in these studies, other automatic processes, both social and non- social, may be relevant to suicidality. For example, people's automatic reactions to best friends, parents, siblings, and perhaps even general social constructs such as "others," "people," or "society" may be relevant predictors of suicidality as well. Future research may benefit from addressing these issues, as well as the specific mechanisms through which such automatic interpersonal processes predict suicidal thought and more severe forms of suicidality.

Indeed, in line with the idea that automatic processes play a powerful role in a variety of aspects of cognition and behavior (see Bargh & Chartrand, 1999; Fazio & Olson, 2014; Gawronski & Bodenhausen, 2006), other researchers have begun to investigate the possibility that some automatic processes may guide people toward death by suicide (see Nock & Banaji, 2007; Nock, Park, Finn, Deliberto, Dour, & Banaji, 2010). Although the idea that some people may have automatic inclinations toward suicide may appear at odds with evolution, which would favor automatic inclinations toward survival, philosophers and

scholars have long considered the adaptive utility of altruistic and even self-sacrificial acts (Blake, 1978; Huebner & Hauser, 2011), and a recent extension of the interpersonal theory suggests humans may be a eusocial species for whom suicide is a deranged form of self-sacrifice (Joiner, Hom, Hagan, & Silva, 2016). As noted earlier, the interpersonal theory posits that the desire to die by suicide arises when people feel both disconnected from others *and* a burden to others, the latter of which may be considered relevant to self-sacrifice. The idea that suicide may be a derangement of the self-sacrificial aspect of eusociality suggests it may also have automatic properties by connecting it to similar processes that occur in lower-order species, such as ants, snapping shrimp, bees, and naked mole rats, all of which self-sacrifice for the group but none of which probably does so as a function of deliberative processing. It is thus possible that humans have evolved the capacity for this relatively automatic form of self-sacrifice, and suicide may be an extreme form and/or a misfiring of it.

If so, automatic spousal attitudes and other automatic sources of interpersonal affect, may be part of a larger set of automatic processes associated with suicidality. Indeed, other work demonstrates that people who automatically associate themselves with death using an IAT are more likely to attempt suicide (Nock et al., 2010). These self-death associations may capture an automatic form of suicidal thought that, according to the interpersonal theory, stems in part from the automatic social disconnection observed here. In fact, given the presumed automaticity of the self-death associations assessed by the self-death IAT, the automatic partner attitudes assessed here may more strongly predict suicidal thought according to that measure than they predicted the self-report measures used here. Future research may benefit from addressing this possibility.

Future work may also benefit from building on these ideas to better understand the role of automatic processes in suicidal behavior, and doing so likely requires also considering the role of more controlled processes. As we argued earlier, although suicidal thought may form and manifest rather automatically, the actual decision to end one's life may require extensive deliberation, either in the moment of action or repeatedly during previous thoughtful periods that lead to a somewhat automatized implementation mindset in the moment (see Gollwitzer, 1999). After all, as just noted, humans likely evolved numerous automatic "survival instincts" that they must overcome to end their life. One theoretical perspective that may help address the interactive role of these automatic and controlled processes is the recent Dual Implicit Process Model (March, Gartner, Olson, 2018). Supported by prior empirical work (see March, Gaertner, & Olson, 2017), this model proposes two serially linked automatic processes—an initial one that automatically assesses threat to bodily harm and a subsequent one that automatically assesses valence (from negative to positive). Consistent with other dual process models (e.g., Fazio & Olson, 2014), the sequence that unfolds from these automatic processes predicts behavior unless one is both motivated and able to behave otherwise. From this perspective, the automatic impulse to avoid bodily harm is primary, whereas any value placed on dying will be secondary. Accordingly, meeting any automatic desire to die, such as the desire to die provoked by more negative automatic spousal attitudes or any other automatic associations (e.g., Nock et al., 2010), will require cognitive resources and deliberation that allow one to override the primary impulse to live in order to fulfill one's secondary, yet still relatively automatic, impulse to die. Of course, this model is in its

infancy and thus future research is necessary to support these ideas, or other ideas linking automated and controlled processes in suicide.

But beyond suicidality, this work also has theoretical implications for research on relationships. In particular, these findings add to a growing body of research indicating that automatic interpersonal processes have implications that, at least at any particular moment in time, are unique from more controlled processes. But these findings also extend those observations by being the first of which we are aware to demonstrate the implications of automatic partner attitudes for individual well-being, rather than interpersonal well-being. A robust body of work demonstrates that relationships have important implications for physical and mental health (Proulx, Helmes, & Buehler, 2007; Robles, Slatcher, Trombello, & McGinn, 2014), and these findings build upon several different theoretical perspectives to uniquely highlight the role of automatic processes in a particularly critical aspect of poor mental health— suicidal thought (e.g., Wenzel & Beck, 2008). As in other work (McNulty et al., 2013), the longitudinal associations that emerged involving automatic partner attitudes were independent of, and even different from, the ones that involved self-reported relationship evaluations.

It is also worth commenting on the fact that, although some prior work highlights the implications of automatic processes for other automatic processes (e.g., Faure, Hoffman, & Righetti, in press; McNulty et al., 2014), most work, including the current work, highlights the implications of automatic processes for controlled, deliberative processes. Specifically, the current work demonstrated the implications of automatic partner attitudes for self-reported suicidality and prior work has demonstrated the implications of these automatic attitudes for self- reported relationship evaluations (McNulty et al., 2013; Scinta & Gable, 2007) and relationship dissolution (Lee et al., 2010; LeBel & Campbell, 2009). Future work may thus benefit from examining how these automatic processes eventually manifest as such deliberative cognitions.Based on the principles of the dual process models described earlier (e.g., March et al., 2017; Fazio & Olson, 2014), we expect the desire to perceive one's relationship in a positive light, which is ubiquitous (see Murray, 1999), leads people to override negative affective associations involving their partner when they have sufficient cognitive resources to do so. But we also expect that it is inevitable that such resources will be scarce at times, such as during times of stress (see Buck & Neff, 2012), and thus that people will at times be unable to override any negative automatic sentiments. It may be at these times that people are forced to recognize their negative feelings associated with their partners, which may explain why stress exerts powerful effects on both relationship satisfaction (see Neff & Karney, 2017) and suicidal thought (see van Heeringen, 2012).

Finally, in addition to these theoretical considerations, the current work may also have important practical implications. Like other work on implicit social cognition in suicidality (Nock et al., 2010), these results highlight the possibility of developing a novel screening tool.The implicit measure used here was a theoretically relevant and more consistent predictor of suicidal thought than the combination of three highly-related self-report measures of relationship satisfaction. Further, this work may also suggest novel intervention strategies. The evaluative conditioning procedure employed in Study 2 effectively increased automatic partner attitudes relative to a control group (see McNulty et al., 2017), and

changes in these attitudes were associated with reductions in suicidal thought. Given suicidal thoughts are a reliable predictor of suicidal behavior (Franklin et al., 2017), this work thus suggests that conditioning people to feel more positively toward their partners may reduce risk of suicide. Indeed, evaluative conditioning has been used to effectively decrease suicidal thought in non-interpersonal settings (Franklin et al., 2016), and there is reason to expect evaluative conditioning of spousal attitudes may be particularly beneficial for those who are at risk for suicidality due to temporary environmental stressors. One notable example is those separated from their partners due to military service.Military service, particularly deployment, is disruptive to relationships (see Karney & Trail, 2017) and, as a direct result, increases risk for suicide (Pruitt, Smolenski, Reger, Bush, Skopp, & Campise, 2016; Pruitt, Smolenski, Bush, Skopp, Hoyt, & Grady, 2017; Smolenski, Reger, Bush, Skopp, Zhang, & Camprise, 2015). Evaluative conditioning may be one way to provide deployed soldiers and their partners a temporary feeling of social connection to one another that may minimize risk for suicide. Future work may benefit from exploring these possibilities.

Conclusion

In the time it took to read this paper, dozens of our fellow citizens have died by their own hands, many more have attempted to do so and survived, and many more still have been afflicted by thoughts of suicide. A main source for this mortality and morbidity is social disconnection.Novel approaches to combat suicidality are plainly needed, and the very well characterized connection between interpersonal disruption and suicidality, together with the (now increased) importance of the marital relationship, suggest one point of departure. In that context, this research provides evidence that automatic spousal attitudes predict suicidal thought, thereby suggesting they may represent a promising target for clinical risk assessment and therapeutics, which in turn may be life-saving if the findings reported here extend to samples of people at greater risk.

References

Abelson RP, Kinder DR, Peters MD, & Fiske ST (1982). Affective and semantic components in political person perception. Journal of Personality and Social Psychology, 42, 619–630.

Amato PR, Booth A, Johnson DR, & Rogers SJ (2009). Alone together: How marriage in America is changing Cambridge, MA: Harvard University Press

Bagge CL, Glenn CR, & Lee HJ (2013). Quantifying the impact of recent negative life events on suicide attempts. Journal of Abnormal Psychology, 122, 359–368. [PubMed: 23088374]

Bargh JA, & Chartrand TL (1999). The unbearable automaticity of being. American Psychologist, 54, 462–479.

Batterham PJ, Fairweather-Schmidt AK, Butterworth P, Calear AL, Mackinnon AJ, & Christensen H (2014). Temporal effects of separation on suicidal thoughts and behaviours. Social Science & Medicine, 111, 58–63. [PubMed: 24768777]

Batterham PJ, Ftanou M, Pirkis J, Brewer JL, Mackinnon AJ, Beautrais A, … & Christensen H (2015). A systematic review and evaluation of measures for suicidal ideation and behaviors in population-based research. Psychological Assessment, 27, 501– 512. [PubMed: 25496086]

Baumeister RF (1990). Suicide as escape from self. Psychological Review, 97, 90–113. [PubMed: 2408091]

Baumeister RF, & Leary MR (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. Psychological Bulletin, 117, 497–529 [PubMed: 7777651]

Baumeister RF, Campbell JD, Krueger JI, & Vohs KD (2003). Does high self-esteem cause better performance, interpersonal success, happiness, or healthier lifestyles? Psychological Science in the Public Interest, 4, 1–44. [PubMed: 26151640]

Beck AT, Steer RA & Brown G (1996). Beck Depression Inventory II manual San Antonio, TX: The Psychological Corporation.

Betsch T, Plessner H, Schwieren C, & Gütig R (2001). I like it but I don't know why: A value-account approach to implicit attitude formation. Personality and Social Psychology Bulletin, 27, 242–253.

Blake JA 1978 Death by Hand Grenade: Altruistic Suicide in Combat. Suicide and Life- Threatening Behavior, 8, 46–59 [PubMed: 675772]

Borges G, Nock MK, Haro Abad JM, Hwang I, Sampson NA, Alonso J, … Kessler RC (2010). Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. Journal of Clinical Psychiatry, 71(12), 1617–1628. [PubMed: 20816034]

Brown G, Beck AT, Steer R, & Grisham J (2000). Risk factors for suicide in psychiatric outpatients: A 20-year prospective study. Journal of Consulting and Clinical Psychology, 68, 371–377. [PubMed: 10883553]

Bryan CJ, Rudd MD, & Werten-Berger E (2013). Reasons for suicide attempts in a clinical sample of active duty soldiers. Suicide and Life-Threatening Behavior, 144, 148– 152.

Buck AA, & Neff LA (2012). Stress spillover in early marriage: The role of self-regulatory depletion. Journal of Family Psychology, 26, 698–708. [PubMed: 22866931]

Bui KT, Peplau LA, & Hill CT (1996). Testing the Rusbult model of relationship commitment and stability in a 15-year study of heterosexual couples. Personality and Social Psychology Bulletin, 22, 1244–1257.

Cerel J (2015, 4). We Are All Connected in Suicidology: The Continuum of "Survivorship" Invited plenary, American Association of Suicidology, Atlanta, GA.

Choi KH, Wang SM, Yeon B, Suh SY, Oh Y, Lee HK, … & Lee KU (2013). Risk and protective factors predicting multiple suicide attempts. Psychiatry Research, 210, 957–961. [PubMed: 24207008]

Chioqueta AP & Stiles TC (2007). Dimensions of the dysfunctional attitude scale (DAS-A) and the automatic thoughts questionnaire (ATQ-30) as cognitive vulnerability factors in the development of suicide ideation. Behavioural and Cognitive Psychotherapy, 35, 579– 589

Clore GL, & Byrne D (1974). The reinforcement affect model of attraction. In Huston TL (Ed.), Foundations of interpersonal attraction (pp. 143–170). San Diego, CA: Academic Press.

Cunningham WA, Preacher KJ, & Banaji MR (2001). Implicit attitude measures: Consistency, stability, and convergent validity. Psychological Science, 12, 163–170. [PubMed: 11340927]

Cutright P, & Fernquist RM (2001). The age structure of male suicide rates: Measurement and analysis of 20 developed countries, 1955–1994. Social Science Research, 30, 627– 640.

De Schryver M, Hughes S, Rosseel Y, & De Houwer J (2016). Unreliable yet still replicable: A comment on Lebel and Paunonen (2011). Frontiers in Psychology, 6, 1–8.

Dew J (2009). Has the marital time cost of parenting changed over time? Social Forces, 88, 519–541.

Dijksterhuis A, & Nordgren LF (2006). A theory of unconscious thought. Perspectives on Psychological Science, 1, 95–109. [PubMed: 26151465]

Durkheim E (1963). Suicide New York: Free Press (Original work published 1897).

Edwards JE (1994). The study of congruence in organizational behavior research: Critique and proposed alternative. Organizational Behavior and Human Decision Processes, 58, 51– 100.

Essex MJ, & Nam S (1987). Marital status and loneliness among older women: The differential importance of close family and friends. Journal of Marriage and the Family, 49, 93–106.

Faure R, Righetti F, Seibel M, & Hofmann W (in press). Speech is silver, nonverbal behavior is gold: How implicit partner evaluations affect dyadic interactions in close relationships. Psychological Science

Fazio RH (2000). Accessible attitudes as tools for object appraisal: Their costs and benefits. In Maio GR & Olson JM (Eds.), Why we evaluate: Functions of attitudes (pp. 1–36). Mahwah, NJ: Erlbaum.

Fazio RH (2007). Attitudes as object-evaluation associations of varying strength. Social Cognition, 25, 603–637. [PubMed: 19424447]

Fazio RH, Jackson JR, Dunton BC, & Williams CJ (1995). Variability in automatic activation as an unobtrusive measure of racial attitudes: a bona fide pipeline? Journal of Personality and Social Psychology, 69, 1013–1027. [PubMed: 8531054]

Fazio RH, Lenn TM, & Effrein EA (1984). Spontaneous attitude formation. Social Cognition, 2, 217–234.

Fazio RH, & Olson MA (2003). Attitudes: Foundations, functions, and consequences. In Hogg MA & Cooper J (Eds.), The SAGE Handbook of Social Psychology (pp. 139–160). London, England: Sage.

Fazio RH, & Olson MA (2014). The MODE model: Attitude-Behavior Processes as a Function of Motivation and Opportunity. In Sherman JW, Gawronski B, & Trope Y (Eds.). Dual process theories of the social mind (pp. 155–171. New York: Guilford Press.

Fazio RH, Sanbonmatsu DM, Powell MC, & Kardes FR (1986). On the automatic activation of attitudes. Journal of Personality and Social Psychology, 50, 229–238. [PubMed: 3701576]

Finkel EJ, Hui CM, Carswell KL, & Larson GM (2014). The suffocation of marriage: Climbing Mount Maslow without enough oxygen. Psychological Inquiry, 25, 1–41.

Fletcher GJ, & Kerr PS (2010). Through the eyes of love: reality and illusion in intimate relationships. Psychological Bulletin, 136, 627–658. [PubMed: 20565171]

Franklin JC, Ribeiro JD, Fox KR, Bentley KH, Kleiman EM, Huang X, Musacchio KM,Jaroszewski AC,Chang BP, Nock Matthew K. (2017). Risk factors for suicidal thoughts and behaviors: A meta-analysis of 50 years of research. Psychological Bulletin, 143, 187–232 [PubMed: 27841450]

Franklin JC, Fox KR, Franklin CR, Kleiman EM, Ribeiro JD, Jaroszewski AC, … & Nock MK (2016). A brief mobile app reduces nonsuicidal and suicidal self-injury: Evidence from three randomized controlled trials. Journal of Consulting and Clinical Psychology, 84, 544–557. [PubMed: 27018530]

Funk JL, & Rogge RD (2007). Testing the ruler with item response theory: Increasing precision of measurement for relationship satisfaction with the Couples Satisfaction Index. Journal of Family Psychology, 21, 572–583. [PubMed: 18179329]

Gawronski B, & Bodenhausen GV (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change. Psychological Bulletin, 132, 692–731. [PubMed: 16910748]

Gawronski B, Hofmann W, & Wilbur CJ (2006). Are "implicit" attitudes unconscious? Consciousness and Cognition, 15(3), 485–499. [PubMed: 16403654]

Gerstel NR, & Sarkisian N (2006). Marriage: The good, the bad, and the greedy. Contexts, 5, 16–21.l

Greenwald AG, McGhee DE, & Schwartz JLK (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. Journal of Personality and Social Psychology, 74, 1464–1480 [PubMed: 9654756]

Gollwitzer PM (1999). Implementation intentions: Strong effects of simple plans. American Psychologist, 54, 493–503.

Haidt J (2001). The emotional dog and its rational tail: a social intuitionist approach to moral judgment. Psychological Review, 108, 814. [PubMed: 11699120]

Hawkins DN, & Booth A (2005). Unhappily ever after: Effects of long-term, low-quality marriages on well-being. Social Forces, 84, 451–471.

Hendin H (1991). Psychodynamics of suicide, with particular reference to the young. American Journal of Psychiatry, 148, 1150–1158. [PubMed: 1882991]

Hicks LL, McNulty JK, Meltzer AL, & Olson MA (2016). Capturing the interpersonal implications of evolved preferences? Frequency of sex shapes implicit, but not explicit, partner evaluations. Psychological Science, 27, 836–847. [PubMed: 27084851]

Hicks LL, McNulty JK, Meltzer AL, & Olson MA (2018). A dual-process perspective on how sexual experiences shape automatic versus explicit relationship satisfaction: Reply to Brody, Costa, Klapilova, and Weiss. Psychological Science, 29, 670–672. [PubMed: 29470106]

Hofmann W, De Houwer J, Perugini M, Baeyens F, & Crombez G (2010). Evaluative conditioning in humans: a meta-analysis. Psychological Bulletin, 136, 390–421. [PubMed: 20438144]

Holt-Lunstad J, Smith TB, & Layton JB (2010). Social relationships and mortality risk: a meta-analytic review. PLoS Med, 7(7), e1000316. [PubMed: 20668659]

Høyer G, & Lund E (1993). Suicide among women related to number of children in marriage. Archives of General Psychiatry, 50, 134–137. [PubMed: 8427553]

Huebner B, & Hauser MD (2011). Moral judgments about altruistic self-sacrifice: When philosophical and folk intuitions clash. Philosophical Psychology, 24, 73–94.

Joiner T (2005). Why people die by suicide Cambridge, MA: Harvard University Press.

Joiner T (2014). The perversion of virtue: Understanding murder-suicide. New York: OxfordJoiner TE Jr., Conwell Y, Fitzpatrick KK, Witte TK, Schmidt NB, Berlim MT, … & Rudd MD (2005) Four studies on how past and current suicidality relate even when" everything but the kitchen sink" is covaried. Journal of Abnormal Psychology, 114, 291– 303.

Joiner TE Jr., Gencoz F, Gencoz T, Metalsky G, & Rudd MD (2001). Does self-hatred imbue schizophrenia with a suicidal quality? Journal of Psychopathology & Behavioral Assessment, 23, 107–116.

Joiner TE, Hom MA, Hagan CR, & Silva C (2016). Suicide as a derangement of the self- sacrificial aspect of eusociality. Psychological Review, 123, 235–254. [PubMed: 26524155]

Joiner TE, Pfaff JJ, & Acres JG (2002). A brief screening tool for suicidal symptoms in adolescents and young adults in general health settings: reliability and validity data from the Australian National General Practice Youth Suicide Prevention Project. Behaviour Research and Therapy, 40, 471–481. [PubMed: 12008659]

Joiner TE, Van Orden KA, Witte TK, & Rudd MD (2009). The Interpersonal Theory of Suicide: Guidance for working with suicidal clients Washington, D.C: American Psychological Association.

Jones CR, Olson MA, & Fazio (2010). Evaluative Conditioning: The "How" Question. Chapter in Olson JM & Zanna MP (Eds.), Advances in Experimental Social Psychology (Vol. 43) San Diego: Academic Press.

Karney BR, & Bradbury TN (1995). The longitudinal course of marital quality and stability: A review of theory, methods, and research. Psychological Bulletin, 118, 3–34. [PubMed: 7644604]

Karney BR, & Trail TE (2017). Associations between prior deployments and marital satisfaction among army couples. Journal of Marriage and Family, 79, 147–160.

Kazan D, Calear AL, & Batterham PJ (2016). The impact of intimate partner relationships on suicidal thoughts and behaviours: A systematic review. Journal of Affective Disorders, 190, 585–598. [PubMed: 26583348]

Kelley HH, Berscheid E, Christensen A, Harvey JH, Huston TL, Levinger G, … Peterson DR (1983). Analyzing close relationships. In Kelley HH, Berscheid E, Christensen A, Harvey JH, Huston TL, Levinger G, …Peterson DR (Eds.), Close relationships (pp. 20–67). New York, NY: Freeman.

Kelley HH, & Thibaut JW (1978). Interpersonal relations: A theory of independence New York: Wiley.

Kenny DA, Kashy DA, & Cook WL (2006). Dyadic Data Analysis New York: Guilford.

Kendrick RV, & Olson MA (2012). When feeling right leads to being right in the reporting of implicitly-formed attitudes, or how I learned to stop worrying and trust my gut. Journal of Experimental Social Psychology, 48, 1316–1321.

Klonsky ED, & May AM (2014). Differentiating suicide attempters from suicide ideators: A critical frontier for suicidology research. Suicide and Life-Threatening Behavior, 44, 1–5. [PubMed: 24313594]

Kposowa AJ (2000). Marital status and suicide in the National Longitudinal Mortality Study. Journal of Epidemiology and Community Health, 54, 254–261. [PubMed: 10827907]

Kunda Z (1990). The case for motivated reasoning. Psychological Bulletin, 108, 480–498. [PubMed: 2270237]

Leary MR, & Baumeister RF (2000). The nature and function of self- esteem: Sociometer theory. Advances in Experimental Social Psychology, 32, 1–62.

LeBel EP, & Campbell L (2009). Implicit partner affect, relationship satisfaction, and the prediction of romantic breakup. Journal of Experimental Social Psychology, 45, 1291– 1294.

LeBel EP, & Paunonen SV (2011). Sexy but often unreliable: The impact of unreliability on the replicability of experimental findings with implicit measures. Personality and Social Psychology Bulletin, 37(4), 570–583. [PubMed: 21441219]

Lee S, Rogge RD, & Reis HT (2010). Assessing the seeds of relationship decay using implicit evaluations to detect the early stages of disillusionment. Psychological Science, 21, 857–864. [PubMed: 20483827]

Lorant V, Kunst V, Huisman M, Costa G, & Mackenbach J (2005). Socio-economic inequalities in suicide: A European comparative study. British Journal of Psychiatry, 187, 49–54. [PubMed: 15994571]

Lord FM (1956). The measurement of growth. Educational and Psychological Measurement, 16, 421–4.

March DS, Gartner L, Olson MA (2018). On the prioritized processing of threat in a dual implicit process model of evaluation. Psychological Inquiry, 29, 1–13.

March DS, Gartner L, Olson MA (2017). In harm's way: On preferential response to threatening stimuli. Personality and Social Psychology Bulletin, 43, 1519–1529. [PubMed: 28914143]

McGee R, Williams S, & Nada-Raja S (2001). Low self-esteem and hopelessness in childhood and suicidal ideation in early adulthood. Journal of Abnormal Child Psychology, 29, 289–291.

McNulty JK (2016). Should spouses be demanding less from marriage? A contextual perspective on the implications of interpersonal standards. Personality and Social Psychology Bulletin, 42, 444–457. [PubMed: 26984011]

McNulty JK, Baker LR, & Olson MA (2014). Implicit self-evaluations predict changes in implicit partner evaluations. Psychological Science, 25, 1649–1657. [PubMed: 24958686]

McNulty JK, & Karney BR (2001). Attributions in marriage: Integrating specific and global evaluations of a relationship. Personality and Social Psychology Bulletin, 27(8), 943–955.

McNulty JK, & Olson MA (2015). Integrating automatic processes into theories of relationships. Current Opinion in Psychology, 1, 107–112.

McNulty JK, Olson MA, Meltzer AL, & Shaffer MJ (2013). Though they may be unaware, newlyweds implicitly know whether their marriage will be satisfying. Science, 342, 1119–1120. [PubMed: 24288337]

McNulty JK, Olson MA Jones RE, & Acosta LM (2017). Automatic associations between one's partner and one's affect as the proximal mechanism of change in relationship satisfaction: Evidence from evaluative conditioning. Psychological Science OnlineFirst.

Metalsky GI, & Joiner TE Jr. (1997). The hopelessness depression symptom questionnaire. Cognitive Therapy and Research, 21, 359–384.

Miotto P, & Preti A (2008). Suicide ideation and social desirability among school-aged young people. Journal of Adolescence, 31, 519–533. [PubMed: 17868799]

Murray SL (1999). The quest for conviction: Motivated cognition in romantic relationships. Psychological Inquiry, 10, 23–34.

Murray SL, Holmes JG, & Pinkus RT (2010). A smart unconscious? Procedural origins of automatic partner attitudes in marriage. Journal of Experimental Social Psychology, 46, 650–656. [PubMed: 20526450]

Neff LA, & Karney BR (2017). Acknowledging the elephant in the room: How stressful environmental contexts shape relationship dynamics. Current Opinion in Psychology, 13, 107–110. [PubMed: 27766285]

Nisbett RE, & Wilson TD (1977). Telling more than we can know: Verbal reports on mental processes. Psychological Review, 84, 231–259.

Nock MK, & Banaji MR (2007). Prediction of suicide ideation and attempts among adolescents using a brief performance-based test. Journal of Consulting and Clinical Psychology, 75, 707–715. [PubMed: 17907852]

Nock MK, Park JM, Finn CT, Deliberto TL, Dour HJ, & Banaji MR (2010).Measuring the suicidal mind: implicit cognition predicts suicidal behavior. Psychological Science, 21, 511–517. [PubMed: 20424092]

Norton R (1983). Measuring marital quality: A critical look at the dependent variable. Journal of Marriage and the Family, 45, 141–151.

Olson MA, Fazio RH, & Hermann AD (2007). Reporting tendencies underlie discrepancies between implicit and explicit measures of self-esteem. Psychological Science, 18, 287–291. [PubMed: 17470249]

Osgood CE, Suci GJ, & Tannenbaum PH (1957). The measurement of meaning Urbana, IL: University of Illinois Press.

Payne BK, Cheng CM, Govorun O, & Stewart BD (2005). An inkblot for attitudes: Affect misattribution as implicit measurement. Journal of Personality and Social Psychology, 89, 277–293. [PubMed: 16248714]

Payne BK, Vuletich HA, & Lundberg KB (2017). The bias of crowds: How implicit bias bridges personal and systemic prejudice. Psychological Inquiry, 28(4), 233–248.

Phillips JE, & Olson MA (2014). When implicitly and explicitly measured racial attitudes align: The roles of social desirability and thoughtful responding. Basic and Applied Social Psychology, 36, 125–132.

Pinquart M (2003). Loneliness in married, widowed, divorced, and never-married older adults. Journal of Social and Personal Relationships, 20, 31–53.

Proulx CM, Helms HM, & Buehler C (2007). Marital quality and personal well-being: A meta-analysis. Journal of Marriage and Family, 69, 576–593.

Pruitt LD, Smolenski DJ, Reger MA, Bush NE, Skopp NA, & Campise RL (2016). Department of Defense Suicide Event Report (DoDSER): Calendar year 2014 annual report Washington, DC: US Department of Defense.

Pruitt LD, Smolenski DJ, Bush NE, Skopp NA, Hoyt TV, & Grady BJ (2017). Department of Defense Suicide Event Report (DoDSER): Calendar year 2015 annual report Washington, DC: US Department of Defense.

Robles TF, Slatcher RB, Trombello JM, & McGinn MM (2014). Marital quality and health: A meta-analytic review. Psychological Bulletin, 140, 140–187. [PubMed: 23527470]

Rogge RD, Fincham FD, Crasta D, & Maniaci MR (2017). Positive and negative evaluation of relationships: Development and validation of the Positive-Negative Relationship Quality (PN-RQ) Scale. Psychological Assessment, 29, 1028–1043. [PubMed: 27736125]

Rogosa DR, & Willett JB (1983). Demonstrating the reliability of difference scores in the measurement of change. Journal of Educational Measurement, 20, 333–343.

Russell JA, 2003 Core affect and the psychological construction of emotion. Psychological Review 110, 145–172. [PubMed: 12529060]

Schachter S, & Singer JE (1962). Cognitive, social and physiological determinants of emotional state. Psychological Review, 69, 379–399. [PubMed: 14497895]

Schumm WR, Paff-Bergen LA, Hatch RC, Obiorah FC, Copeland JM, Meens LD, & Bugaighis MA (1986). Concurrent and discriminant validity of the Kansas Marital Satisfaction Scale. Journal of Marriage and Family, 48, 381–387.

Schwarz N, & Clore GL (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. Journal of Personality and Social Psychology, 45, 513–523.

Scinta A, & Gable SL (2007). Automatic and self-reported attitudes in romantic relationships. Personality and Social Psychology Bulletin, 33, 1008–1022. [PubMed: 17502418]

Smith CT, & Nosek BA (2011). Affective focus increases the concordance between implicit and explicit attitudes. Social Psychology, 42, 300–313.

Shneidman ES (1985). Definition of suicide New York, NY: Wiley.

Shneidman ES (1998). Perspectives on suicidology: Further reflections on suicide and psychache. Suicide and Life-Threatening Behavior, 28, 245–250. [PubMed: 9807770]

Smith CT, & Nosek BA (2011). Affective focus increases the concordance between implicit and explicit attitudes. Social Psychology 42, 300–313.

Smolenski DJ, Reger MA, Bush NE, Skopp NA, Zhang Y, & Camprise RL (2015). Department of Defense Suicide Event Report: Calendar Year 2013 Annual Report Tacoma, WA: National Center for Telehealth & Technology.

Stack S (1990). The effect of divorce on suicide in Denmark, 1951–1980. The Sociological Quarterly, 31, 359–370.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Stack S (1998). Marriage, family and loneliness: A cross-national study. Sociological Perspectives, 41, 415–432.

Sveen CA, & Walby FA (2008). Suicide survivors' mental health and grief reactions: A systematic review of controlled studies. Suicide and Life-Threatening Behavior, 38, 13– 29. [PubMed: 18355105]

van Heeringen K, 2012 Stress-diathesis model of suicidal behavior. In: Dwivedi Y (Eds.), The Neurobiological Basis of Suicide CRC Press, Boca Raton, pp. 113–124.

Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, & Joiner TE Jr (2010). The interpersonal theory of suicide. Psychological Review, 117, 575–600. [PubMed: 20438238]

Wentura D, & Degner J (2010). A practical guide to sequential priming and related tasks. Handbook of implicit social cognition: Measurement, theory, and applications, 95–116.

Wenzel A, & Beck AT (2008). A cognitive model of suicidal behavior: Theory and treatment. /Applied and Preventive Psychology, 12, 189–201.

Wilburn VR, & Smith DE (2005). Stress, self-esteem, and suicidal ideation in late adolescents. Adolescence, 40, 33–45. [PubMed: 15861616]

Witte TK, Holm-Denoma JM, Zuromski KL, Gauthier JM, & Ruscio J (2017). Individuals at high risk for suicide are categorically distinct from those at low risk. Psychological Assessment, 29, 382–393. [PubMed: 27280745]

World Health Organization [WHO]. (2014). Preventing suicide: A global imperative. Geneva.

Wyder M, Ward P, & De Leo D (2009). Separation as a suicide risk factor. Journal of Affective Disorders, 116, 208–213. [PubMed: 19128839]

Wyer RS Jr, Clore GL, & Isbell LM (1999). Affect and information processing. In Advances in Experimental Social Psychology (Vol. 31, pp. 1–77). Academic Press.

Zajonc RB (1980). Feeling and thinking: Preferences need no inferences. American Psychologist, 35, 151–175.

Table 1.

Descriptive Statistics and Reliabilities for Implicit Measures in Study 1a and Study 1b

	M	*SD*	*α*	*M*	*SD*	*α*	Split –half	Attitude Index
Study 1a	Block 1			Block 2				
Spouse								
Facilitation to pos. words	42.75	130.70	.74	120.82	138.89	.68	.72	--
Facilitation to neg. words	27.94	141.71	.67	142.32	150.77	.74	.72	--
Difference	14.81	127.80	--	−21.50	108.85	--	.37	−3.35 (97.43)
Self								
Facilitation to pos. words	32.18	142.95	.61	121.98	138.80	.72	.77	--
Facilitation to neg. words	18.23	148.27	.70	137.77	153.20	.73	.75	--
Difference	13.95	109.75	--	−15.79	103.05	--	.37	−0.92 (87.91)
Study 1b	Block 1			Block 2				
Spouse								
Facilitation to pos. words	10.47	104.43	.74	76.07	104.57	.68	.57	--
Facilitation to neg. words	4.90	122.73	.67	94.87	109.75	.74	.63	--
Difference	5.57	120.13	--	−18.79	99.41	--	.40	−6.61 (91.99)
Self								
Facilitation to pos. words	−7.18	112.34	.61	71.05	115.13	.72	.67	--
Facilitation to neg. words	−18.54	134.89	.70	73.38	120.79	.73	.66	--
Difference	11.36	117.29	--	−2.32	107.16	--	.45	4.52 (95.47)

Note. Means and *SD*s are in ms and are facilitation scores formed by subtracting RTs following partner/self primes from RTs following the neutral prime; thus, higher scores indicate greater facilitation by the partner/self primes to positive and negative words. Facilitation score difference formed by subtracting the negative facilitation score from the positive facilitation score; thus higher scores indicate greater facilitation to positive words. Alphas are internal consistencies among RTs following primes. Split halves are associations between facilitation scores from block 1 and block 2, estimated in a multilevel model with a fixed intercept (GEE).

Table 2.

Automatic Spousal Attitudes Predicting the Probability Subsequent Suicidal Thought in Study 1a and 1b.

	Study 1a					Study 1b					Pooled				
	b	SE	p	dfs	OR	b	SE	p	dfs	OR	b	SE	p	dfs	OR
Attitude Index = Raw Difference, Controlling BL Difference															
Simplest Model															
Intercept	−2.48	0.26	<.001	106	---	−5.21	0.53	<.001	84	---	−3.46	0.32	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	1.93	0.61	.002	190	6.88
Initial Suicidal Thought	3.34	0.81	<.001	94	28.09	3.74	0.91	<.001	71	42.03	3.26	0.62	<.001	167	25.97
BL RT difference	0.53	0.30	.077	94	1.70	0.98	0.29	.001	71	2.65	0.48	0.23	.044	167	1.61
Spousal attitude	**−0.27**	**0.19**	**.159**	**94**	**0.76**	**−1.86**	**0.40**	**<.001**	**71**	**0.16**	**−0.52**	**0.21**	**.016**	**167**	**0.59**
With Additional Covariates															
Intercept	−2.77	0.31	<.001	106	---	−5.27	0.35	<.001	84	---	−3.65	0.38	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	1.88	0.63	.003	190	6.52
Initial Suicidal Thought	3.28	1.01	.002	90	26.57	2.88	0.61	<.001	67	17.76	3.01	0.68	<.001	163	20.27
BL RT difference	0.65	0.31	.037	90	1.91	0.85	0.32	.010	67	2.34	0.60	0.24	.014	163	1.82
Age	−0.73	0.40	.069	90	0.48	0.22	0.53	.682	67	1.25	−0.46	0.35	.181	163	0.63
Education	0.18	0.32	.575	90	1.20	−1.10	0.32	<.001	67	0.33	−0.03	0.26	.909	163	0.97
Marital satisfaction	−0.34	0.25	.173	90	0.71	−0.39	0.22	.078	67	0.67	−0.32	0.18	.069	163	0.72
Self-attitude	−0.17	0.25	.491	90	0.84	−0.41	0.40	.311	67	0.66	−0.22	0.23	.349	163	0.81
Spousal attitude	**−0.21**	**0.24**	**.366**	**90**	**0.81**	**−1.57**	**0.39**	**<.001**	**67**	**0.21**	**−0.46**	**0.24**	**.058**	**163**	**0.63**
Attitude Index = Facilitation Score Difference															
Simplest Model															
Intercept	−2.52	0.28	<.001	106	---	−4.57	0.55	<.001	84	---	−3.51	0.36	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	1.98	0.65	.003	190	7.22
Initial Suicidal Thought	3.38	0.86	<.001	93	29.34	3.17	0.91	<.001	72	23.75	3.25	0.67	<.001	167	25.70
Spousal attitude	**−0.59**	**0.30**	**.055**	**93**	**0.55**	**−1.17**	**0.22**	**<.001**	**72**	**0.31**	**−0.68**	**0.25**	**.008**	**167**	**0.51**
With Additional Covariates															
Intercept	−2.77	0.29	<.001	106	---	−4.54	0.44	<.001	84	---	−3.66	0.40	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	1.89	0.67	.005	190	6.61
Initial Suicidal Thought	3.23	1.08	.004	89	25.19	2.29	0.63	<.001	68	9.89	2.94	0.76	<.001	163	18.89

	Study 1a					Study 1b					Pooled				
	b	SE	p	N	OR	b	SE	p	N	OR	b	SE	p	N	OR
Automatic Spousal Attitudes Predict Suicidality 61															
Age	-0.69	0.35	.049	89	0.50	0.01	0.58	.984	68	1.01	-0.48	0.33	.141	163	0.62
Education	0.18	0.32	.571	89	1.20	-0.87	0.27	.002	68	0.42	-0.02	0.26	.942	163	0.98
Marital satisfaction	-0.30	0.23	.196	89	0.74	-0.41	0.21	.056	68	0.66	-0.31	0.17	.080	163	0.74
Self-attitude	0.02	0.32	.952	89	1.02	0.05	0.19	.790	68	1.05	-0.04	0.29	.884	163	0.96
Spousal attitude	**-0.62**	**0.39**	**.119**	**89**	**0.54**	**-1.07**	**0.29**	**<.001**	**68**	**0.34**	**-0.69**	**0.34**	**.041**	**163**	**0.50**
Attitude Index = Facilitation Score Difference, Controlling BL (Preferred)															
Simplest Model															
Intercept	-2.66	0.33	<.001	106	---	-4.82	0.36	<.001	84	---	-3.65	0.36	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	2.13	0.62	<.001	190	8.38
Initial Suicidal Thought	3.44	0.79	<.001	91	31.32	3.47	0.81	<.001	70	32.01	3.33	0.62	<.001	165	28.07
BL RT pos. words	-0.93	0.58	.114	91	0.39	1.06	0.69	.129	70	2.89	-0.21	0.51	.676	165	0.81
BL RT neg. words	0.46	0.67	.493	91	1.59	-1.49	0.73	.046	70	0.22	-0.28	0.59	.640	165	0.76
Spousal attitude	**-0.46**	**0.33**	**.165**	**91**	**0.63**	**-1.78**	**0.40**	**<.001**	**70**	**0.17**	**-0.79**	**0.32**	**.015**	**165**	**0.45**
With Additional Covariates															
Intercept	-2.89	0.36	<.001	106	---	-5.67	0.18	<.001	84	---	-3.78	0.39	<.001	190	---
Study dummy code	---	---	---	---	---	---	---	---	---	---	2.01	0.61	<.001	190	7.43
Initial Suicidal Thought	3.28	1.01	.002	87	26.56	2.96	0.61	<.001	66	19.28	3.06	0.70	<.001	161	21.40
BL RT pos. words	-1.08	0.69	.122	87	0.34	1.15	1.01	.261	66	3.16	-0.24	0.61	.690	161	0.78
BL RT neg. words	0.74	0.86	.394	87	2.09	-2.69	1.30	.043	66	0.07	-0.21	0.74	.783	161	0.81
Age	-0.66	0.39	.095	87	0.52	0.40	0.51	.437	66	1.49	-0.41	0.36	.262	161	0.66
Education	0.22	0.32	.484	87	1.25	-1.35	0.32	<.001	66	0.26	-0.02	0.25	.941	161	0.98
Marital satisfaction	-0.32	0.24	.191	87	0.72	-0.55	0.21	.010	66	0.58	-0.32	0.18	.086	161	0.73
Self-attitude	0.11	0.37	.770	87	1.11	-1.31	0.59	.031	66	0.30	-0.11	0.34	.747	161	0.90
Spousal attitude	**-0.43**	**0.38**	**.251**	**87**	**0.65**	**-1.53**	**0.35**	**<.001**	**66**	**0.22**	**-0.73**	**0.35**	**.039**	**161**	**0.48**

Note. Raw Difference formed by subtracting the average of the RTs to positive words following spouse/self primes during both blocks from the average of the RTs to negative words following spouse/self primes during both blocks; thus, higher scores indicate faster categorization of positive relative to negative words following the spouse/self prime. BL RT difference formed by subtracting the average of the RTs to positive words following the neutral prime during the orientation block from the average of the RTs to negative words following the neutral prime during the orientation block; thus, higher scores indicate faster categorization of positive relative to negative words following the neutral prime. Facilitation Score Difference computing by forming the difference between RTs to positive words following neutral versus spouse/self primes (RTs to positive, neutral - RTs to positive, spouse/self) and subtracting from it the difference between RTs to negative words following neutral versus spouse/self primes (RTs to negative, neutral - RTs to negative, spouse/self) [i.e., (RT positive, neutral – RT positive, spouse/self) – (RT negative, neutral – RT negative, spouse/self); thus higher scores indicate greater facilitation to positive words following spouse/self primes. Study Dummy Code = 1 for Study 1a and 0 for Study 1b, entered grand-centered. negative.negative, spouse/self) [i.e., (RT positive, neutral – RT positive,

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spouse/self) – (RT negative, neutral – RT negative, spouse/self); thus higher scores indicate greater facilitation to positive words following spouse/self primes. Study Dummy Code = 1 for Study 1a and 0 for Study 1b, entered grand-centered.

Table 3.

Descriptive Statistics and Reliabilities for Implicit Measures in Study 2

	M	*SD*	α	*M*	*SD*	α	split-half	**Attitud Index**
Time 1		Block 1			Block 2			
Spouse								
Facilitation to pos. words	−20.96	75.54	.91	7.14	85.71	.89	.56	--
Facilitation to neg. words	−8.40	77.60	.91	24.75	81.97	.93	.53	--
Difference	−12.56	83.31	--	−17.60	85.46	--	.38	−15.08 (70.21)
Self								
Facilitation to pos. words	−30.06	80.97	.91	16.70	83.67	.91	.47	--
Facilitation to pos. words	−28.50	81.89	.89	10.43	92.41	.90	.52	--
Difference	−1.56	90.59	--	6.26	85.55	--	.26	2.35 (69.93)
Time 2		Block 1			Block 2			
Spouse								
Facilitation to pos. words	−16.79	77.69	.88	−1.99	77.97	.91	.54	--
Facilitation to neg. words	−7.70	71.95	.91	8.45	72.29	.90	.48	--
Difference	−9.10	88.13	--	−10.44	89.53	--	.44	−9.77 (75.47)
Self								
Facilitation to pos. words	−15.16	78.47	.90	0.71	76.43	.72	.56	--
Facilitation to neg. words	−24.47	79.25	.92	2.55	69.21	.73	.47	--
Difference	9.31	83.99	--	−1.84	77.51	--	.39	3.74 (67.33)
Time 3		Block 1			Block 2			
Spouse								
Facilitation to pos. words	−9.32	79.15	.91	0.36	76.89	.93	.58	--
Facilitation to neg. words	−0.72	75.52	.91	6.77	75.63	.91	.51	--
Difference	−8.61	86.96	--	−6.40	75.89	--	.32	−7.51 (66.32)
Self								
Facilitation to pos. words	−10.84	67.25	.90	3.61	79.41	.72	.55	--
Facilitation to neg. words	−7.31	71.37	.90	2.24	80.46	.73	.45	--
Difference	−3.54	79.44	--	1.37	87.82	--	.31	−1.08 (67.86)
Time 4		Block 1			Block 2			
Spouse								
Facilitation to pos. words	−8.50	71.54	.92	1.38	80.53	.93	.39	--
Facilitation to pos. words	2.49	68.48	.86	13.25	65.47	.90	.43	--
Difference	−10.98	80.54	--	−11.87	83.83	--	.31	−11.43 (66.63)
Self								
Facilitation to pos. words	−11.38	76.47	.90	5.34	75.60	.91	.54	--
Facilitation to neg. words	−2.28	73.66	.88	8.02	77.59	.89	.58	--
Difference	−9.10	90.63	--	−2.68	88.81	--	.52	−5.89 (78.38)

Note. Means and *SD*s are in ms and are facilitation scores formed by subtracting RTs following partner/self primes from RTs following the neutral prime; thus, higher scores indicate greater facilitation by the partner/self primes to positive and negative words. Facilitation score difference formed

by subtracting the negative facilitation score from the positive facilitation score; thus higher scores indicate greater facilitation to positive words. Alphas are internal consistencies among RTs following primes. Split halves are associations between facilitation scores from block 1 and block 2, estimated in a multilevel model with a fixed intercept (GEE).

Table 4.

Associations among Automatic Attitudes Over Time in Study 2

Positive	Time 1	Time 2	Time 3	Time 4
Time 1		.47**	.42**	.31**
Time 2	.36**		.31**	.30**
Time 3	.31**	.29**		.37**
Time 4	.13†	.18**	.34**	
Negative	Time 1	Time 2	Time 3	Time 4
Time 1		.41**	.24**	.18*
Time 2	.41**		.26**	.14*
Time 3	.37**	.22**		.29**
Time 4	.15*	.29**	.28**	
Index (Difference)	Time 1	Time 2	Time 3	Time 4
Time 1		.07	−.01	.18†
Time 2	.17*		.01	−.01
Time 3	−.00	.04		14†
Time 4	.14	.19**	.08	

Note.

†
$p < .10$

*
$p < .05$

**
$p < .01$.

Attitudes are facilitation scores. Parameter estimates are standardized betas that control for corresponding RTs during orientation block estimated in multilevel models with a fixed intercept (GEE). Estimates for spouse attitudes appear below the diagonal and estimates for self- attitudes appear above the diagonal.

Table 5.

Automatic Spousal Attitudes Predicting Probability Subsequent Suicidal Thought in Study 2.

	b	SE	P	dfs	OR
Attitude Index = Raw Difference, Controlling BL Difference					
Simplest Model					
Intercept	−5.07	0.32	<.001	121	---
Condition	1.21	0.29	<.001	121	3.36
Initial Suicidal Thought	3.94	0.74	<.001	99	51.46
Initial BL RT Difference	−0.74	0.21	<.001	99	0.48
Initial Spousal Attitude	0.14	0.36	.704	99	1.15
BL RT Difference	0.67	0.21	.002	99	1.95
Conditioned Spousal Attitude	**−0.36**	**0.17**	**.033**	**99**	**0.70**
With Additional Covariates					
Intercept	−4.97	0.27	<.001	121	---
Condition	1.19	0.27	<.001	121	3.30
Initial Suicidal Thought	4.08	0.71	<.001	95	59.40
Initial BL RT Difference	−0.70	0.24	.005	95	0.50
Initial Spousal Attitude	0.17	0.28	.548	95	1.18
BL RT Difference	0.56	0.19	.004	95	1.75
Age	0.09	0.21	.654	95	1.10
Education	−0.25	0.10	.011	95	0.78
Marital Satisfaction	0.09	0.18	.611	95	1.09
Self-Attitude	0.23	0.13	.081	95	1.26
Conditioned Spousal Attitude	**−0.48**	**0.12**	**<.001**	**95**	**0.62**
Attitude Index = Facilitation Score Difference					
Simplest Model					
Intercept	−5.03	0.43	<.001	121	---
Condition	1.23	0.31	<.001	121	3.44
Initial Suicidal Thought	3.89	0.73	<.001	102	48.77
Initial Spousal Attitude	0.51	0.36	.163	102	1.66
Conditioned Spousal Attitude	**−0.64**	**0.16**	**<.001**	**102**	**0.53**
With Additional Covariates					
Intercept	−4.85	0.28	<.001	121	---
Condition	1.14	0.27	<.001	121	3.13
Initial Suicidal Thought	3.87	0.72	<.001	98	47.93
Initial Spousal Attitude	0.50	0.29	.088	98	1.64
Age	0.01	0.22	.953	98	1.01
Education	−0.33	0.12	.006	98	0.72
Marital Satisfaction	0.08	0.20	.677	98	1.08
Self-Attitude	−0.11	0.11	.300	98	0.89
Conditioned Spousal Attitude	**−0.59**	**0.14**	**<.001**	**98**	**0.55**

Attitude Index = Facilitation Score Difference, Controlling BL (Preferred)

	b	SE	P	dfs	OR	
Simplest Model						
Intercept	−5.11	0.22	<.001	121	---	
Condition	1.30	0.26	<.001	121	3.65	
Initial Suicidal Thought	3.94	0.79	<.001	98	51.01	
Initial BL RT Pos Words	0.53	0.47	.259	98	1.70	
Initial BL RT Neg Words	−0.63	0.43	.146	98	0.53	
Initial Spousal Attitude	0.23	0.45	.603	98	1.26	
BL RT Pos Words	−0.61	0.88	.486	98	0.54	
BL RT Neg Words	0.14	0.80	.861	98	1.17	
Conditioned Spousal Attitude	**−0.64**	**0.24**	**.008**	**98**	**0.53**	
With Additional Covariates						
Intercept	−4.95	0.17	<.001	121	---	
Condition	1.19	0.23	<.001	121	3.28	
Initial Suicidal Thought	3.87	0.74	<.001	94	48.06	
Initial BL RT Pos Words	0.43	0.33	.193	94	1.53	
Initial BL RT Neg Words	−0.57	0.30	.058	94	0.56	
Initial Spousal Attitude	0.22	0.35	.532	94	1.24	
BL RT Pos Words	−0.32	0.80	.686	94	0.72	
BL RT Neg Words	−0.21	0.76	.784	94	0.81	
Age	0.14	0.19	.457	94	1.15	
Education	−0.38	0.12	.002	94	0.69	
Marital Satisfaction	−0.08	0.16	.630	94	0.93	
Self-Attitude	−0.08	0.12	.481	94	0.92	
Conditioned Spousal Attitude	**−0.65**	**0.20**	**.002**	**94**	**0.52**	

Note. Raw Difference formed by subtracting the average of the RTs to positive words following spouse/self primes during both blocks from the average of the RTs to negative words following spouse/self primes during both blocks; thus, higher scores indicate faster categorization of positive relative to negative words following the spouse/self prime. BL RT difference formed by subtracting the average of the RTs to positive words following the neutral prime during the orientation block from the average of the RTs to negative words following the neutral prime during the orientation block; thus, higher scores indicate faster categorization of positive relative to negative words following the neutral prime. Facilitation Score Difference computing by forming the difference between RTs to positive words following neutral versus spouse/self primes (RTs to positive, neutral - RTs to positive, spouse/self) and subtracting from it the difference between RTs to negative words following neutral versus spouse/self primes (RTs to negative, neutral - RTs to negative, spouse/self) [i.e., (RT positive, neutral – RT positive, spouse/self) – (RT negative, neutral – RT negative, spouse/self); thus higher scores indicate greater facilitation to positive words following spouse/self primes.

Table 6.

Integrated Data Analysis of the Association between Automatic Spousal Attitudes and Suicidal Thought Pooling Data from All Three Studies

	b	SE	p	dfs	OR
Attitude Index = Raw Difference, Controlling BL Difference					
Simplest Model					
Intercept	−3.80	0.31	<.001	311	---
Study Dummy 1	2.10	0.58	<.001	311	8.19
Study Dummy 2	0.29	0.70	.686	311	1.33
Initial Suicidal Thought	3.12	0.54	<.001	267	22.68
BL RT Difference	0.43	0.21	.038	267	1.54
Spousal Attitude	**−0.52**	**0.19**	**.008**	**267**	**0.60**
With Additional Covariates					
Intercept	−3.92	0.35	<.001	311	---
Study Dummy 1	2.15	0.63	<.001	311	8.60
Study Dummy 2	0.35	0.76	.640	311	1.42
Initial Suicidal Thought	2.89	0.56	<.001	263	17.99
BL RT Difference	0.52	0.21	.015	263	1.69
Age	−0.39	0.28	.165	263	0.68
Education	−0.08	0.23	.725	263	0.92
Marital Satisfaction	−0.32	0.17	.068	263	0.73
Self-Attitude	−0.15	0.21	.472	263	0.86
Spousal Attitude	**−0.48**	**0.21**	**.022**	**263**	**0.62**
Attitude Index = Facilitation Score Difference					
Simplest Model					
Intercept	−3.86	0.32	<.001	312	---
Study Dummy 1	2.10	0.59	<.001	312	8.13
Study Dummy 2	0.12	0.66	.856	312	1.13
Initial Suicidal Thought	3.24	0.54	<.001	274	25.63
Spousal Attitude	**−0.58**	**0.21**	**.005**	**274**	**0.56**
With Additional Covariates					
Intercept	−3.96	0.36	<.001	312	---
Study Dummy 1	2.09	0.62	<.001	312	8.05
Study Dummy 2	0.15	0.68	.828	312	1.16
Initial Suicidal Thought	3.01	0.56	<.001	270	20.22
Age	−0.42	0.26	.104	270	0.66
Education	−0.08	0.21	.696	270	0.92
Marital Satisfaction	−0.29	0.17	.085	270	0.75
Self-Attitude	−0.04	0.22	.844	270	0.96
Spousal Attitude	**−0.59**	**0.27**	**.028**	**270**	**0.55**
Attitude Index = Facilitation Score Difference, Controlling BL (Preferred)					
Simplest Model					

	b	*SE*	*p*	*dfs*	*OR*	
Intercept	−3.99	0.32	<.001	312	---	
Study Dummy 1	2.50	0.58	<.001	312	12.14	
Study Dummy 2	0.37	0.70	.602	312	1.44	
Initial Suicidal Thought	3.33	0.51	<.001	272	27.80	
BL RT Pos Words	−0.22	0.47	.645	272	0.80	
BL RT Neg Words	−0.28	0.54	.601	272	0.75	
Spousal Attitude	**−0.69**	**0.27**	**.010**	**272**	**0.50**	
With Additional Covariates						
Intercept	−4.08	0.35	<.001	312	---	
Study Dummy 1	2.48	0.62	<.001	312	11.99	
Study Dummy 2	0.42	0.74	.566	312	1.53	
Initial Suicidal Thought	3.11	0.52	<.001	268	22.37	
BL RT Pos Words	−0.26	0.55	.643	268	0.77	
BL RT Neg Words	−0.24	0.67	.721	268	0.79	
Age	−0.35	0.28	.220	268	0.71	
Education	−0.10	0.21	.640	268	0.91	
Marital Satisfaction	−0.31	0.17	.078	268	0.73	
Self-Attitude	−0.11	0.26	.675	268	0.90	
Spousal Attitude	**−0.64**	**0.29**	**.027**	**268**	**0.53**	

Note. Raw Difference formed by subtracting the average of the RTs to positive words following spouse/self primes during both blocks from the average of the RTs to negative words following spouse/self primes during both blocks; thus, higher scores indicate faster categorization of positive relative to negative words following the spouse/self prime. BL RT difference formed by subtracting the average of the RTs to positive words following the neutral prime during the orientation block from the average of the RTs to negative words following the neutral prime during the orientation block; thus, higher scores indicate faster categorization of positive relative to negative words following the neutral prime. Facilitation Score Difference computing by forming the difference between RTs to positive words following neutral versus spouse/self primes (RTs to positive, neutral - RTs to positive, spouse/self) and subtracting from it the difference between RTs to negative words following neutral versus spouse/self primes (RTs to negative, neutral - RTs to negative, spouse/self) [i.e., (RT positive, neutral – RT positive, spouse/self) – (RT negative, neutral – RT negative, spouse/self); thus higher scores indicate greater facilitation to positive words following spouse/self primes. Study Dummy 1 = 1 for Study 1a and 0 for the other two studies; Study Dummy 2 = 1 for Study 1b and 0 for the other two studies, both entered grand-centered.