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The Effects of Cuddling on Relational Quality for Married Couples: A Longitudinal Investigation

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This study examined the longitudinal effects of cuddling on relational quality for married couples. In a four-week experiment, 80 adults were randomly assigned to one of three conditions: increased cuddling *(treatment),* increased time spent together *(comparison),* or no change in behavior *(control).* Controlling for the pretest relational quality scores and changes in kissing behavior, individuals in the treatment condition reported more relational satisfaction and lower quality of alternatives after four weeks than did individuals in the comparison and control conditions. The comparison and control conditions did not differ from each other on any relational outcomes.

Keywords: Affection; Commitment; Cuddling; Quality of Alternatives; Relational Satisfaction

Social interaction and, in particular, human touch are crucial to human development (Baumeister & Leary, 1995). Affectionate communication represents a form of interaction that can positively influence one's well-being (Burleson, Trevathan, & Todd, 2007; Floyd, 2006). Receiving welcomed nonverbal affection has been linked to improvements in physiological (Light, Grewen, & Amico, 2005), psychological (Floyd et al., 2005), and relational outcomes (Floyd et al., 2009). Although these effects occur relatively consistently in laboratory and self-report studies, examining them in naturalistic settings—e.g.,

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by documenting couples' daily interactions—potentially increases the ecological validity of laboratory findings (Roberts, Tsai, & Coan, 2007).

A common form of affectionate communication for romantic couples is cuddling (van Anders, Edelstein, Wade, & Samples-Steele, 2013). Cuddling is defined as "intimate, physical, and loving contact that does not involve sexual behavior and that involves some degree of whole-body touching (i.e., not just hand-hand or lips-lips)" (van Anders et al., p. 554). Cuddling is reserved for close relationships (van Raalte & Floyd, 2016) and has been connected to feelings of intimacy and closeness (Hughes & Kruger, 2011; Muise, Giang, & Impett, 2014). Despite the relational benefits associated with cuddling (L'Abate, 2001), very few studies focus specifically on this behavior. Although not all forms of received affectionate behavior are beneficial (Floyd & Morman, 1997), affectionate behavior is generally associated with myriad health and relational benefits (Floyd, 2006). For example, frequent partner hugs have been associated with higher oxytocin levels and lower blood pressure for premenopausal women (Light et al., 2005). Moreover, affection has been linked to self-reports of relationship satisfaction, intimacy, and closeness (Horan & Booth-Butterfield, 2010; Hughes & Kruger, 2011; Muise et al., 2014).

The goal of the present study is to examine the extent to which increasing cuddling among married couples affects relational quality through the lens of affection exchange theory (AET; Floyd, 2019).

The Benefits of Touch and Affection

Considerable research connects affectionate communication to a variety of health outcomes (Burleson et al., 2007; Floyd, 2019). For example, receiving frequent passionate kisses from a romantic partner has been associated with decreases in cholesterol (Floyd et al., 2009), and affectionate communication received from a spouse has been linked to hormonal stress regulation via cortisol and dehydroe-piandrosterone-sulfate (Floyd & Riforgiate, 2008). Similarly, Ditzen et al. (2007) found that receiving positive touch from a partner significantly lowered cortisol and heart rate responses to a laboratory-induced stressor, compared to receiving no touch or only verbal social support.

Several studies have focused specifically on the benefits of receiving hugs. For example, for premenopausal women, receiving more hugs from their male romantic partners is associated with higher circulating oxytocin and lower baseline blood pressure (Light et al., 2005). Moreover, Cohen, Janicki-Deverts, Turner, and Doyle (2015) asked healthy adults to record their daily receipt of hugs for a two-week period. Participants were then quarantined, exposed to a rhinovirus, and monitored for flu symptom severity. Results showed that the frequency of received hugs predicted less-severe symptomology. Sumioka, Nakae, Kanai, and Ishiguro (2013) have even demonstrated that simulated hugging, via a wearable hugging device, can reduce levels of the stress hormone cortisol.

Although most scholarship examines the beneficial effects of *receiving* affection or touch (Grewen, Girdler, Amico, & Light, 2005), research has also connected

expressed affection to improved health (Floyd et al., 2005, 2018). For example, expressing affection through writing a letter to a loved one has been linked with lipid decreases (Floyd, Mikkelson, Hesse, & Pauley, 2007). Even touch that is not intended to be affectionate has been linked to health advantages. For example, a touch on the wrist has been shown to decrease heart rate (Nilsen & Vrana, 1998), and a touch on the shoulder can reduce sensitivity to pain (Floyd, Ray, van Raalte, Stein, & Generous, 2018).

Although the mechanisms for the benefits of touch are not entirely clear, research provides compelling evidence that receiving and expressing affection are beneficial, at least when touch is interpreted positively (Floyd & Morman, 1997) and when it occurs within what AET refers to as the range of tolerance. The range of tolerance illustrates that each individual has both a minimum and maximum threshold for affectionate behavior (including touch), within which the behavior is beneficial. Indeed, the importance of this range is reaffirmed with research revealing problems with receiving too little touch (Floyd, 2014) and too much (Hesse, Mikkelson, & Saracco, 2018). For example, receiving affection from strangers—and even from acquaintances and intimate partners, under certain circumstances—can invoke psychosomatic anxiety, stress, and relational harm (van Raalte, Kloeber, Veluscek, & Floyd, 2016). Therefore, affectionate touch is theorized to be beneficial when it is positively received and when it occurs at an acceptable level.

A shortcoming of research examining the health effects of touch, however, is that much of it has been conducted only in controlled laboratory settings (Ditzen et al., 2007; Grewen et al., 2005; Nilsen & Vrana, 1998). Examining affectionate behavior in everyday interactions can advance our understanding of this type of communication and provide information on how these interactions influence relational quality.

The Nature of Cuddling

van Anders et al. (2013) claim that cuddling is "intimate, physical, and loving contact that does not involve sexual behavior and that involves some degree of whole body touching (i.e., not just hand-hand or lips-lips)" (p. 554). Given this definition, cuddling shares space with hugging; however, the two behaviors differ. Hugs are typically short touches (i.e., lasting from 1–5 seconds; Rabinowitz, 1991). In contrast, cuddling typically lasts for a much longer time, usually from 30–45 minutes (van Anders et al., 2013; van Raalte & Floyd, 2016) to several hours (L'Abate, 2001).

The relational context also designates conceptual differences between cuddling and hugging. Hugs can occur in a variety of relationships (Rabinowitz, 1991), whereas cuddling is typically reserved for close relationships such as romantic partners or family members (L'Abate, 2001; van Anders et al., 2013).

For romantic couples, cuddling most often occurs on a couch or in bed (van Anders et al., 2013), and is common before and after sexual activity (Hughes & Kruger, 2011). Typical behaviors during cuddling include hugging, spooning, touching/rubbing, kissing, holding each other, and talking (van Anders et al.). Similarly, Muise et al. (2014) found that post-coital affection (including cuddling) was

associated with higher relationship satisfaction and sexual satisfaction. Although cuddling occurs around (and sometimes during) sexual activity, it more often serves the purposes of non-sexual relational bonding and intimacy building (Hughes & Kruger, 2011; L'Abate, 2001; van Raalte & Floyd, 2016).

We propose that cuddling is experienced mostly as a nonsexual type of behavior that can be isolated as a unique communicative event. To explain why cuddling might produce relational benefits, we invoke the theoretical lenses of affection exchange theory (AET; Floyd, 2019) and the investment model (Rusbult, 1980), detailed subsequently.

Affection Exchange Theory and the Investment Model

Grounded in a neo-Darwinian perspective, AET was developed as a comprehensive theory of affection (Floyd, 2006). AET asserts that affectionate communication is adaptive with respect to human survival and fertility. For survival, affection can help buffer against harmful psychological and physiological stressors by strengthening pair bonds (Floyd & Riforgiate, 2008). For example, past research has indicated that affection contributes to the development of pair bonds through processes such as relational satisfaction (Floyd et al., 2005), relational maintenance (Dainton, Stafford, & Canary, 1994), and investments (Horan & Booth-Butterfield, 2010). In terms of fertility, affectionate behaviors between romantic partners can promote sexual activity, thereby facilitating direct procreation (Floyd, 2019). One method of examining the way that cuddling might improve a relationship is by measuring the relational markers identified in the investment model (Rusbult, 1980).

The investment model (Rusbult, 1980) claims that the interdependence between relational partners influences partners' commitment to the relationship. In the model, relational satisfaction and investments positively predict commitment, and quality of alternatives negatively predicts commitment. *Relational satisfaction* represents the subjective attitude and affective experience of one's relationship (Hendrick & Hendrick, 1997); *investments* are "resources that become attached to a relationship and would decline in value or be lost if the relationship were to end" (Rusbult, Martz, & Agnew, 1998, p. 359); *quality of alternatives* represents one's perceptions of attractive relational options outside of the relationship which would provide superior outcomes than the current relationship (Le & Agnew, 2003); and *commitment* represents a person's decision to continue to be a part of a relationship (Le & Agnew, 2003).

There is a clear link between affection and relationship quality. For example, physical affection has been linked to several relational advantages that encourage pair bonding, such as relationship satisfaction, intimacy, and closeness (Floyd et al., 2009; Horan & Booth-Butterfield, 2010; Hughes & Kruger, 2011; Muise et al., 2014). Relationally satisfied individuals are more likely to stay in a relationship (Le & Agnew, 2003; Rusbult, 1980), which provides increased access to the benefits of a romantic relationship (e.g., support, affection, resources) and, in turn, facilitates long-term survival (Floyd, 2006).

Horan and Booth-Butterfield (2010) examined the relationships between the investment model variables and affection among 72 couples. They found that affection was positively and significantly related to relational satisfaction and commitment, but no associations were significant for investment or quality of alternatives. It is possible that these effects for investment and quality of alternatives may not have appeared in cross-sectional designs such as theirs, but changes in affectionate behavior over time may produce results for all four investment model variables. According to AET (Floyd, 2006), affection enhances pair bonds, thus directly influencing relational quality markers in the investment model. Thus, the current study examines the influence of affection (specifically cuddling) on these four relational health markers (relational satisfaction, investments, commitment, and quality of alternatives) longitudinally and experimentally.

The current study largely follows Floyd et al.'s (2009) study of romantic kissing. In their experiment, participants were instructed to kiss their partner more (treatment group) or not to change their behavior (control group) over the course of six weeks. When compared to the control group, participants in the treatment group reported decreased stress, enhanced relationship satisfaction, and exhibited reductions in total serum cholesterol.

The present study improves on Floyd et al.'s (2009) design by including a comparison group to test the alternative explanation that simply increasing the time spent together (rather than increasing cuddling) produces changes in relational quality, irrespective of affectionate behavior. Increasing time spent together at meal times was the activity selected for the comparison group. Research suggests that novel activities that are exciting and physiologically arousing positively influence relationship qualities such as relational satisfaction compared to more mundane, but still pleasant, activities (Aron, Norman, Aron, McKenna, & Heyman, 2000). Eating together is a fairly typical activity for cohabitating couples, it is typically not physiologically arousing, and it would be a type of activity that does not easily provide opportunities for cuddling, or, more broadly, affectionate behavior. Thus, increased time spent together over meal time was not theorized to influence relational quality markers as much as increased cuddling would.

Based on AET (Floyd, 2006) and research indicating a positive relationship between affectionate behavior and relational quality (Ditzen et al., 2007; Horan & Booth-Butterfield, 2010), we expect that increases in cuddling (treatment group) will produce relational benefits beyond that created by spending increased mealtime together (comparison group) and those who do not change their behavior (control group).

> H: Individuals in the treatment group report higher relational satisfaction (1), higher investment (2), higher commitment (3), and lower quality of alternatives (4) than individuals in the comparison and control groups.

It is possible that increasing mutual mealtime (i.e., the comparison group) might influence study outcomes compared to not changing behavior (i.e., the control group). For example, joint activities as routine maintenance behaviors may enhance relationship quality (Dainton et al., 1994). Other research indicates no relationship between joint

activities and relational quality (Berg, Trost, Schneider, & Allison, 2001; Reissman, Aron, & Bergen, 1993). No previous research has examined the relational effects of increased mutual meal times. Thus, a research question is offered:

> RQ: Do the comparison and control groups differ on their reports of relational satisfaction (1), investments (2), commitment (3), and quality of alternatives (4)?

Method

Procedures and Participants

After approval by the university's IRB, a one-week pilot study was conducted to test the manipulations, instructions, and procedures. Following a successful pilot test, participants were recruited for the full study. Amazon.com's Mechanical Turk (MTurk) was used to recruit participants to an initial online prescreening questionnaire through the survey platform Qualtrics. Participants received $0.75USD in Amazon.com credit for their participation in the prescreening survey. To qualify, participants had to a) live in the United States; b) be married; c) have lived with their spouse for at least three months; d) not be currently pregnant or actively trying to become pregnant; and e) be able to speak and read English.

The prescreening survey included all study measures and represents Time 1 (T_1) outcomes. In all, 407 prospective participants completed the prescreening measure; of that number, 117 (29.25%) met all study qualifications and were invited to participate in the full study. Of those, 91 (77.78%) agreed to participate and were sent a $10 Amazon.com gift card as a pre-study incentive. Participants were then randomly assigned into either the treatment, comparison, or control conditions.

Of the 91 individuals who agreed to participate in the full study, 11 participants dropped out during the four-week study (a 12% attrition rate), resulting in a final sample of 80.[1] The sample included men ($n = 27$) and women ($n = 53$) with ages ranging from 24 to 74 years ($M = 42.85$ years, $SD = 12.37$).[2] The majority of participants identified as White/Caucasian ($n = 68$), followed by Asian ($n = 5$), Hispanic/Latino ($n = 3$), African American ($n = 3$), and other ($n = 1$). Participants' education level included a high school degree ($n = 7$), some college but no degree ($n = 20$), associate's degree ($n = 9$), bachelor's degree ($n = 29$), master's degree ($n = 12$), PhD degree ($n = 1$), and other ($n = 2$). Frequencies of combined household income included $25,000 ($n = 5$), $50,000 or less ($n = 18$), $75,000 or less ($n = 28$), $100,000 or less ($n = 16$), $150,000 or less ($n = 10$), or more than $150,000 ($n = 3$). All participants were married ($M = 11.15$ years, $SD = 10.83$) and reported living with their spouse for 3–12 months ($n = 5$), 1+ years ($n = 15$), 5+ years ($n = 25$), 10+ years ($n = 16$), 20+ years ($n = 12$), 30+ years ($n = 5$), or 40+ years ($n = 2$). No participants reported being pregnant or trying to become pregnant. Thirty participants had a child living at home. For those who had a child living at home, the average age of the child was 5.34 years ($SD = 3.70$).

Experimental Procedures

This study used a pretest-posttest control design with three conditions: (1) a treatment group that increased time spent cuddling, (2) a comparison group that increased time spent together at meal times, and (3) a control group that did not change their behavior. Stratified by biological sex, random assignment was used to place participants into one of the three conditions using a randomization application from the random.org website. Participants in the treatment group ($n = 25$) were told to cuddle more with their romantic partner. Suggested increased time spent cuddling was from 30 minutes to 45 minutes, and/or from four cuddles a week to nearly every day. Participants were instructed to continue cuddling with their romantic partner the way they normally do but more often and/or for longer periods. They were also provided a definition of cuddling based on the one by van Anders et al. (2013).

To facilitate increased time spent together, participants in the comparison group ($n = 30$) were instructed to increase the frequency and/or duration of meal times with their romantic partner. Participants in the control group ($n = 25$) were given instructions to maintain their normal routine with their romantic partner (i.e., were told that the researchers were interested in how couples interact over time and that their responses will help assess the daily life of romantic couples).

Participants began the four-week study on a Monday and were sent condition-specific reminders every Wednesday. On the Friday of the last week, all participants were invited to complete an online survey including all study measures and manipulation checks serving as the Time 2 (T_2) measures. After successfully completing the last online survey, participants were sent a second $10 Amazon.com gift card and thanked for their participation.

Instrumentation

Relational Quality Measures
The 22-item Investment Model Scale (IMS; Rusbult et al., 1998) assessed four relational quality markers: relational satisfaction, investment, quality of alternatives, and commitment.[3] Items were prefaced with the statement: "Considering your romantic partner, please indicate how much you agree or disagree with the following statements." Each item was assessed on a 0 (*do not agree at all*) to 9 (*agree completely*) response scale. Five items each measured relationship satisfaction (e.g., "I feel satisfied with our relationship"), quality of alternatives (e.g., "The people other than my partner with whom I might become involved are very appealing"), and investment (e.g., "I have put a great deal into our relationship that I would lose if the relationship were to end"). Seven items measured commitment (e.g., "I want our relationship to last for a very long time"). Cronbach's alpha for each sub-scale was acceptable at T_1 and T_2. See Table 1 for descriptive statistics and alpha reliability estimates for each subscale for T_1 and T_2.

Table 1 Means, Standard Deviations, Alpha Reliabilities, and Effect Sizes for Self-Report Outcomes

Variable	Condition	T1 M(SD)	T1 α	T2 M(SD)	T2 α
Relational Satisfaction	Treatment	7.69(1.60)	.97	8.14(1.03)	.97
	Comparison	7.43(1.85)		7.15(2.42)	
	Control	6.89(2.49)		6.66(2.88)	
Investment	Treatment	7.33(1.48)	.84	8.07(0.99)	.89
	Comparison	7.45(1.45)		8.11(1.35)	
	Control	6.85(2.18)		7.14(2.33)	
Quality of Alternatives	Treatment	3.42(1.73)	.87	1.75(1.02)	.92
	Comparison	3.47(1.85)		2.31(2.18)	
	Control	3.04(2.12)		2.91(2.15)	
Commitment	Treatment	8.55(0.92)	.93	8.85(0.35)	.94
	Comparison	8.40(1.07)		8.20(1.63)	
	Control	7.69(2.36)		7.70(2.39)	

Note. All self-report outcomes were measured on 9-point scales wherein higher scores correspond to greater values. The alpha reliability estimates represent the scale reliability for all participants at Time 1 or Time 2.

Manipulation Checks

A 25-item Likert-type scale was developed to check study manipulations and to assess other potential control variables at T_2. Items were prefaced with the following statement: "Considering the last week with your romantic partner, please indicate how much you agree or disagree with the following statements." Each item was assessed on a 1 (*strongly disagree*) to 7 (*strongly agree*) response scale. Three of the 25 items measured change in cuddling (e.g., "My romantic partner and I have been cuddling more than we normally do") and were averaged to create a composite variable for each experimental condition: $M_{treatment}$ = 5.47 (SD = 1.67); $M_{comparison}$ = 4.62 (SD = 2.20); $M_{control}$ = 3.75 (SD = 1.81); Cronbach's α = .96. Three items measured time spent on shared meals (e.g., "My romantic partner and I have been spending more time eating together than usual") and were averaged to create a composite variable for each experimental condition: $M_{treatment}$ = 3.81 (SD = 2.07); $M_{comparison}$ = 5.44 (SD = 1.76); $M_{control}$ = 3.40 (SD = 1.64); Cronbach's α = .90. The remaining 19 items were designed to measure other potentially interesting variables (e.g., changes in sexual activity, sleep patterns, conflict activity) and to disguise the real manipulation checks. See Table 2 for means and standard deviations for the individual items used in manipulation checks at T_2.

Demographic and Relationship Information

At T_1 only, participants were asked demographic questions including age, sex, ethnicity, marriage length, cohabitation length, education level, and combined household income.

Table 2 Means and Standard Deviations for Items Used in Manipulation Check Scale at T$_2$

Item	Treatment Group M(SD)	Comparison Group M(SD)	Control Group M(SD)
My romantic partner and I have been cuddling more.	5.52(1.69)	4.67(2.47)	3.68(1.91)
I have been cuddling with my romantic partner more often.	5.52(1.64)	4.53(2.43)	3.60(1.94)
My romantic partner and I have been in physical contact more often.	5.36(1.80)	4.67(1.95)	3.96(1.95)
My romantic partner and I have been spending more time eating together than usual.	4.24(2.17)	5.60(1.92)	3.64(1.91)
My romantic partner and I have had more meals together lately.	3.84(2.25)	5.57(2.01)	3.52(1.87)
My romantic partner and I have been spending more time cooking together.	3.36(2.52)	5.17(2.07)	3.04(1.84)
The quality of our sexual activity has been better.	4.64(1.91)	4.43(2.30)	3.44(2.02)
My romantic partner and I have been engaging in sexual activity more often.	3.72(2.11)	3.70(2.49)	2.96(1.90)
My romantic partner and I have been kissing more often.	4.84(1.80)	4.60(2.30)	3.48(1.98)
I have been falling asleep a lot quicker than I normally do.	4.16(2.23)	4.63(2.21)	4.20(1.80)
I have experienced fewer interruptions while sleeping.	4.40(2.12)	4.37(2.34)	4.48(1.64)
I have felt more rested than normal.	4.32(1.97)	3.93(2.38)	3.76(1.83)
My romantic partner and I have been experiencing more conflict than we normally do.	1.76(1.48)	2.77(2.45)	2.52(1.94)
My romantic partner and I have been fought more than we typically do.	1.84(1.70)	2.37(2.11)	2.00(1.63)
I have been giving my partner more compliments.	5.20(1.80)	4.83(2.10)	3.92(1.75)
My romantic partner and I have verbally expressed our love more often than we normally do.	4.96(1.57)	4.50(2.22)	3.92(1.85)
My romantic partner and I have been more open with each other.	5.12(1.81)	5.07(1.72)	4.16(1.86)
I have spent more time with my romantic partner than usual.	4.56(2.33)	5.20(1.88)	3.56(1.87)
I have been in my partner's presence more often than usual.	4.12(2.40)	4.93(2.21)	4.12(1.94)
My romantic partner and I have been doing a lot more favors for each other.	4.52(2.00)	4.73(1.91)	3.76(1.90)

(*Continued*)

Table2 (Continued)

Item	Treatment Group M(SD)	Comparison Group M(SD)	Control Group M(SD)
My romantic partner and I have been exercising more often than usual.	3.40(2.04)	2.97(2.11)	2.88(1.72)
The communication with my romantic partner has been better.	5.20(1.61)	4.87(2.05)	4.16(1.89)
My romantic partner and I have been more positive with each other.	5.20(1.80)	5.10(2.04)	4.20(2.08)
I have felt more relaxed than usual.	4.16(2.15)	4.00(2.24)	3.44(1.96)
I have been more aware of my nutrition lately.	4.32(1.91)	4.20(2.11)	4.12(1.83)

Note. Participants were instructed to "think about your relationship over the last week" and to indicate their level of agreement with each statement. Scores were rated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The three italicized items in the table were averaged to create a manipulation check for the cuddling (treatment) manipulation. The three items in bold were averaged to create a manipulation check for the increased time spent on shared meals (comparison) manipulation.

Results

Manipulation Checks

To test the effects of the treatment manipulation on increased cuddling at T_2, a one-way ANOVA with a planned contrast was conducted. Contrast coefficients were +2 for the treatment condition and −1 for both the comparison and control conditions (i.e., treatment > comparison = control). There was a significant effect of the contrasts on increased cuddling at T_2, $F(2, 77) = 4.99$, $p < .01$, partial $\eta^2 = .11$. Mean values were greater in the treatment condition ($M = 5.47$, $SD = 1.67$) than the comparison ($M = 4.62$, $SD = 2.20$) and control condition ($M = 3.75$, $SD = 1.81$) combined, $t(77) = 2.76$, $p < .01$, indicating success for the increased cuddling manipulation. An independent samples t-test revealed that the comparison and control group did not significantly differ in change in their cuddling time, $t(53) = 1.59$, $p = .12$.

To test the effects of the comparison manipulation on shared meal time at T_2, a one-way ANOVA with a planned contrast was conducted. Contrast coefficients were +2 for the comparison condition and −1 for both the treatment and control conditions (i.e., comparison > treatment = control). There was a significant effect of the contrasts on shared meal time, $F(2, 77) = 9.82$, $p < .001$, partial $\eta^2 = .20$. Mean values were greater in the comparison condition ($M = 5.44$, $SD = 1.76$) than the treatment ($M = 3.81$, $SD = 2.07$) and control conditions ($M = 3.40$, $SD = 2.02$) combined, $t(77) = 4.34$, $p < .001$, indicating success for the increased shared meal time manipulation. An independent samples t-test revealed that the treatment and control group did not significantly differ in the change of their shared meal time, $t(48) = .78$, $p = .44$.[4]

To test if there were condition differences on the remaining 19 items of the 25-item scale, one-way ANOVAs were conducted with condition as the independent factor and each item as outcomes. Only responses to the change in kissing item differed significantly across groups, $F(2, 77) = 3.17$, $p < .05$, $\eta^2 = .08$. A Tukey HSD post hoc analysis revealed that the treatment condition ($M = 4.84$, $SD = 1.80$) reported more kissing than the comparison condition ($M = 4.60$, $SD = 2.30$; $p = .90$), and the control condition ($M = 3.48$, $SD = 1.98$; $p = .06$), but these differences were not significant. The comparison and control conditions did not significantly differ on this item ($p = .12$). Because this item showed a significant group difference with the one-way ANOVA, it will be investigated as a covariate in the hypothesis tests.

Tests of Initial Group Equivalence

To test for T_1 equivalency of the three groups, all relational health outcomes were analyzed using two-way (i.e., sex-by-treatment condition) between groups ANOVAs. Results revealed no main effects of sex or treatment condition, and no sex-by-condition interaction effects for any of the four outcomes (all p's > .05). In summary,

there was T_1 equivalency between the treatment conditions (see Table 1 for all T_1 outcomes).

Hypothesis Tests

The hypothesis predicted individuals in the treatment condition would report higher relational satisfaction, investment, and commitment, and lower quality of alternatives than individuals in the comparison and control conditions at T_2. Before testing the hypothesis, eight potential control variables were explored: 1) age; 2) sex; 3) ethnicity; 4) cohabitation length; 5) education level; 6) combined household income; 7) having a child living at home; and 8) change in kissing. Out of the eight potential control variables, only change in kissing behavior at T_2 was significantly related to relational satisfaction, $r = .66$, $p < .001$, investment, $r = .40$, $p < .001$, commitment, $r = .45$, $p < .001$, and quality of alternatives, $r = -.40$, $p < .001$. These findings provide more support for including change in kissing behavior as a covariate in all subsequent analyzes.

Tests on the outcome variables relevant to the hypothesis were conducted using a series of hierarchical multiple regressions. Hierarchical regression tests allowed us to determine if, after accounting for T_1 study outcome scores and change in kissing behavior, T_2 study outcome scores are different for the treatment group compared to the comparison and control groups. Thus, in each hierarchical multiple regression, one of the T_2 study outcome variables was entered as the criterion variable. The predictors were entered in the following order: Step 1 included the corresponding T_1 study outcome and change in kissing variable, and Step 2 included the experimental condition variable (dummy coded as 1 = treatment condition, 0 = comparison and control conditions). By conducting the hierarchical regressions this way, we are able to test whether the treatment condition predicts unique variance in the T_2 study outcomes while controlling for the T_1 study outcomes and change in kissing behavior.

Our research question asked if the comparison and control groups differed on the study outcomes and was also tested with a series of hierarchical multiple regressions for each of the four dependent variables. The setup for the hierarchical multiple regressions was replicated to control for scores at T_1 and change in kissing behavior at T_2; however, the treatment condition was excluded from the experimental condition variable (dummy coded as 1 = comparison condition, 0 = control condition).

Relational Satisfaction

The first part of the hypothesis predicted that the treatment group will report more relational satisfaction than the comparison and control group, and the first part of the research question asked whether the latter two groups differ. In the first step, the regression of T_1 relational satisfaction and change in kissing behavior on T_2 relational satisfaction was significant (see Table 3 for full regression results). In the final model, a main effect of the treatment condition with a positive coefficient ($\beta = .11$, $p = .04$) accounted for a statistically significant proportion of variance ($\Delta R^2 = .01$) in T_2

Table 3 Hierarchical Multiple Regression Analyzes Predicting T2 Study Outcomes and Change in Kissing Behavior

| | Study Outcomes at T_2 | | | | | | | |
| | Relational Satisfaction | | Investment | | Quality of Alt. | | Commitment | |
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.73***		.55***		.37***		.63***	
T1 outcome		.58***		.65***		.48***		.70***
Change in kissing behavior		.45***		.22**		−.24**		.21**
Step 2	.01*		.002		.03*		.01†	
T1 outcome		.57**		.65***		.50***		.69***
Change in kissing behavior		.43**		.21**		−.20*		.19**
Dummy code[a]		.11*		.05		−.19*		.11†
Total Adjusted R^2	.73***		.54***		.38***		.63***	
n	80		80		80		80	

Note. $^\dagger p = .06$. $^*p < .05$. $^{**}p < .01$. $^{***}p < .001$.
[a]Dummy code in Step 2 designates the experimental condition variable dummy coded as 1 = treatment condition, and 0 = comparison and control conditions.

relational satisfaction scores beyond T_1 relational satisfaction ($\beta = .57$, $p < .001$) and change in kissing behavior ($\beta = .43$, $p < .001$), $R^2 = .74$, adjusted $R^2 = .73$, $F(3, 76) = 70.39$, $p < .001$. Thus, this prediction was supported.

To explore the research question, a multiple hierarchical regression was performed. In the first step, the regression of T_1 relational satisfaction and change in kissing behavior on T_2 relational satisfaction was significant. In the final model, the addition of the dummy coded comparison versus control condition ($\beta = -.10$, $p = .16$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .009$) in T_2 relational satisfaction scores beyond T_1 relational satisfaction ($\beta = .59$, $p < .001$) and change in kissing behavior ($\beta = .45$, $p < .001$), $R^2 = .78$, adjusted $R^2 = .76$, $F(3, 51) = 58.87$, $p < .001$. Thus, the comparison and control condition did not significantly differ from each other on T_2 relational satisfaction scores.

Investment

The second part of the hypothesis predicted that the treatment group will report more investment than the comparison and control group, and the second part of the research question asked whether the latter two groups differ. In the first step, the regression of T_1 investment and change in kissing behavior on T_2 investment was significant. In the final model, the addition of the dummy coded treatment condition ($\beta = .05$, $p = .26$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .002$) in T_2 investment scores beyond T_1 investment ($\beta = .65$, $p < .001$) and change in kissing behavior ($\beta = .21$, $p = .01$), $R^2 = .56$, adjusted $R^2 = .54$, $F(3, 76) = 31.71$, $p < .001$. Thus, this prediction was not supported.

To explore the research question, a multiple hierarchical regression was tested. In the first step, the regression of T_1 investment and change in kissing behavior on T_2 investment was significant. In the final model, the addition of the dummy coded comparison versus control condition ($\beta = .08$, $p = .31$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .007$) in T_2 investment scores beyond T_1 investment ($\beta = .72$, $p < .001$) and change in kissing behavior ($\beta = .19$, $p = .04$), $R^2 = .66$, adjusted $R^2 = .64$, $F(3, 51) = 33.07$, $p < .001$. Thus, the comparison and control condition did not significantly differ from each other on T_2 investment scores.

Commitment

The third part of the hypothesis predicted that the treatment group will report more commitment than the comparison and control group, and the third part of the research question asked whether the latter two groups differ. In the first step, the regression of T_1 commitment and change in kissing behavior on T_2 commitment was significant. In the final model, the addition of the dummy coded treatment condition ($\beta = .11$, $p = .06$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .01$) in T_2 commitment scores beyond T_1 commitment ($\beta = .69$, $p <$

.001) and change in kissing behavior ($\beta = .19$, $p = .01$), $R^2 = .64$, adjusted $R^2 = .63$, $F(3, 76) = 45.13$, $p < .001$. Thus, this prediction was not supported.

To explore the research question, a multiple hierarchical regression was tested. In the first step, the regression of T_1 commitment and change in kissing behavior on T_2 commitment was significant. In the final model, the addition of the dummy coded comparison versus control condition ($\beta = -.08$, $p = .34$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .006$) in T_2 commitment scores beyond T_1 commitment ($\beta = .74$, $p < .001$) and change in kissing behavior ($\beta = .20$, $p = .02$), $R^2 = .69$, adjusted $R^2 = .67$, $F(3, 51) = 37.56$, $p < .001$. Thus, the comparison and control condition did not significantly differ from each other on T_2 commitment scores.

Quality of Alternatives
The fourth part of the hypothesis predicted that the treatment group will report lower quality of alternatives than the comparison and control group, and the fourth part of the research question asked whether the latter two groups differ. In the first step, the regression of T_1 quality of alternatives and change in kissing behavior on T_2 quality of alternatives was significant. In the final model, a main effect of the treatment condition with a negative coefficient ($\beta = -.19$, $p = .02$) accounted for a statistically significant proportion of variance ($\Delta R^2 = .03$) in T_2 quality of alternatives scores beyond T_1 quality of alternatives ($\beta = .50$, $p < .001$) and change in kissing behavior ($\beta = -.20$, $p = .04$), $R^2 = .40$, adjusted $R^2 = .38$, $F(3, 76) = 17.01$, $p < .001$. Thus, this prediction was supported.

To explore the research question, a multiple hierarchical regression was performed. In the first step, the regression of T_1 quality of alternatives and change in kissing behavior on T_2 quality of alternatives was significant. In the final model, the addition of the dummy coded comparison versus control condition ($\beta = -.16$, $p = .15$) did not contribute a significant proportion of explained variance ($\Delta R^2 = .02$) in T_2 quality of alternatives scores beyond T_1 quality of alternatives ($\beta = .58$, $p < .001$) and change in kissing behavior ($\beta = -.17$, $p = .17$), $R^2 = .47$, adjusted $R^2 = .44$, $F(3, 51) = 14.93$, $p < .001$. Thus, the comparison and control condition did not differ significantly from each other on T_2 quality of alternatives scores.

Discussion

Considerable research has connected affectionate communication to a variety of positive relational quality outcomes (for review, see Floyd, 2019). With few exceptions (Burleson et al., 2007; Floyd et al., 2009), researchers examined these effects in a laboratory experiment or with correlational research designs (Ditzen et al., 2007; Grewen et al., 2005; Light et al., 2005). The current investigation sought to address this methodological limitation by examining how the specific affectionate behavior of cuddling influenced four markers of marital quality (Le & Agnew, 2003). Based on AET (Floyd, 2006, 2019), we predicted that individuals who increased cuddling

behaviors with a spouse (treatment condition) would report greater relational satisfaction, investment, and commitment, and lower quality of alternatives, compared to those who increased time spent together performing a shared activity (comparison condition) and those who did not change their behavior (control condition). Further, as not all routine shared activities increase relational quality (Berg et al., 2001; Reissman et al., 1993), a research question asked whether the comparison and control condition differed on the four relational outcomes.

Cuddling and Relational Quality

When controlling for T_1 outcomes and change in kissing behavior, the experimental condition yielded a significant main effect for relational satisfaction and quality of alternatives, but not for reports of investment or commitment. Consistent with our predictions, individuals in the treatment group (i.e., increased cuddling) reported significantly more relational satisfaction, and significantly lower quality of alternatives, at T_2. Several research studies have reported that affection is enacted much more frequently in satisfied relationships (e.g., Floyd et al., 2005; Horan & Booth-Butterfield, 2010). The present results extend these findings and provide evidence for a causal relationship where increasing affectionate touch behaviors through cuddling can cause changes in relational satisfaction. Results are similar to other affection-related interventions such as kissing (Floyd et al., 2009) and physical affection defined as "intimate physical contact not necessarily associated with sex" (Burleson et al., 2007, p. 359).

Additionally, current results suggest that increasing cuddling decreases perceptions of available alternatives partners, compared to not changing one's behavior or simply spending more time together at meals. This is consistent with AET (Floyd, 2006), which predicts that increasing affectionate touching will strengthen romantic partners' pair bonds. Cuddling is an intimate and nurturing behavior that is typically reserved for close partners (van Anders et al., 2013). Increasing such behaviors, possibly in combination with other romantic touching, may lead one to be less attentive to or aware of the desirability of alternative partners (Miller, 1997).

Results of the current study provide direct support for the third AET postulate. Through increased cuddling, relational satisfaction scores increased, and quality of alternatives scores decreased, findings which reflect strengthened pair bonds that promote long-term relationships. As AET asserts (Floyd, 2006, 2019), promoting pair bonds aids in ensuring access to resources necessary for procreation and survival. For example, research has indicated a cyclical causal relationship between nonsexual physical affection and sexual activity on improved mood (Burleson et al., 2007). Therefore, increased romantic touch through cuddling could promote sexual activity and procreation. In addition, affectionate touching through cuddling might make the sex itself more pleasurable which, in turn, promotes future sexual interactions.

Inconsistent with our hypotheses, there were no differences among conditions on investments or commitment. Long-term couples likely consider investments globally (e.g., owning property or having children) and feelings of strong commitment to the relationship had already been established (see Table 1). Thus, this study's four-week time frame was potentially too short to generate substantial changes of investment or commitment for spouses who have been married, and living together, for many years (Horan & Booth-Butterfield, 2010). Moreover, research indicates that the invest-ment-commitment relationship is stronger in short-term relationships (e.g., casual dating) than long-term relationships (e.g., marriage; Le & Agnew, 2003). Thus, ceiling effects may be occurring for these relational quality markers.

Implications

This study's findings provide important implications for practitioners' (e.g., marriage counselors and behavioral therapists) work with romantic couples. Clinicians who work with long-term married couples may suggest an increase in time spent roman-tically touching each other (e.g., through cuddling and/or kissing) as a mechanism to improve relational quality (Floyd, 2019). Caution should be taken not to overgener-alize this effect, however. The current participants entered with relatively high relational satisfaction, so findings may be relevant only to satisfied, and not dis-tressed, couples.

Additionally, cuddling and hugging are increasingly recognized as important affectionate behaviors in nonclinical (and even non-relational) settings. For example, cuddle parties are gaining traction nationally and internationally as a way for adults to engage in safe and monitored affectionate touch (e.g., www.cuddleparty.com). In group cuddle sessions, verbal consent for cuddling is required, participants are encouraged to change their mind if they so wish, no alcohol is permitted, and comfortable (not sexy) pajamas are required. Cuddle party sessions cost from $15-80 per person. Hugging has also been recognized as a way to be interconnected and bonded with another person through hugging meditation. The Buddhist monk teacher, Thich Nhat Hanh, established a hugging mediation to facilitate spiritual, interpersonal, and intrapersonal connections (Hanh, 2000). Thus, outside of scho-larly and clinical studies, affectionate touch is recognized as a relationally and physically rewarding behavior.

Strengths and Limitations

The experimental design represents a strength of the current study. Cross-sectional studies have been criticized (Lindell & Whitney, 2001), as they can only indicate associations – rather than causal relationships – between variables. This study's four-week longitudinal experiment allows clearer insight into the causal and dynamic interplay (Laurenceau & Bolger, 2005) between affectionate touch and relational health. The study design also allowed us to rule out the plausible alternate hypothesis

that simply spending more time together during a routine activity would cause changes in relational quality, at least within a four-week time frame.

Both a strength and limitation to the current study's design is the use of a naturalistic setting. Research examining the health effects of touch often occurs in laboratory settings (Grewen et al., 2005; Light et al., 2005), which highlight the advantages of touch, but ecological validity claims suffer. Thus, by allowing participants to engage in affectionate touch at home, we are confident that the manipulations closely mirror real-life interactions. Yet, without observing couples' behavior in the lab, we cannot be absolutely certain that the intervention involved the specific behavior in question (i.e., cuddling) in isolation from other, similar, behaviors (e.g., hugging, kissing, massaging, fondling). For instance, when compared with the other two groups, the treatment group reported a greater change in kissing behavior, a particularly strong predictor of study outcomes. As a result, caution must be used when interpreting the results as there is no certainty that *only* changes in cuddling occurred in the study.[5]

It is worth noting that the addition of the experimental condition in hierarchical regressions produced *small* increases in explained variance in T_2 relational satisfaction and quality of alternatives (see Table 3); thus, these results should be interpreted with some caution. To be clear, over the course of the four-week experiment, the treatment group reported greater relational satisfaction, but comparison and control groups reported decreased satisfaction (see Table 1).

The sample was also limited to other-sex couples, although there is no theoretical reason to believe the benefits of increased affection are unique to that population. Whereas social proscriptions may make public affectionate behavior riskier for same-sex couples (Carton & Horan, 2014), intimate romantic touch, such as cuddling and kissing, is largely a private behavior. There is every reason to expect that same-sex couples would benefit from cuddling in the same way that other-sex couples do, although this claim awaits empirical verification.

Directions for Future Research

Current findings both improve our understanding of how increasing romantic touch influences relational quality for married individuals and also provides avenues for future research. For example, it is not clear whether increases in romantic touch would influence relational quality for couples who are extremely dissatisfied or who are in relational turmoil (e.g., cases of infidelity). Increasing affectionate touch behaviors during times of relational distress could generate further relationship harm. Similarly, increasing romantic touch that is not genuine or desired by one's partner could result in relational damage. Future work should investigate the performance of, and outcomes generated by, affectionate touch in dissatisfied couples as an initial step toward developing effective affectionate touch intervention strategies.

Another important avenue for cuddling research is to probe the relationship between cuddling and sexual activity. Post-coital affection (including cuddling) is associated with higher relationship satisfaction and sexual satisfaction (Muise et al., 2014). In the current study, there were no significant changes in reported sexual activity (other than kissing) nor significant changes in verbal behaviors (e.g., openness, giving compliments, or verbally expressing love; see Table 2) across conditions. The interplay of these important behaviors (e.g., foreplay, coitus, pillow talk, kissing, and cuddling) on relationship judgments deserves closer scrutiny.

Conclusion

The core aim of this study was to explore how increases in cuddling influence relational quality. Through a longitudinal experimental design, findings indicate that increased affectionate touch through cuddling (and kissing) for cohabitating spouses caused increases in relational satisfaction and decreases in perceived quality of alternatives above and beyond spending time together at meals, or not changing behavior at all. Findings provide important theoretical, clinical, and practical implications for romantic couples seeking to improve their relational quality.

Notes

1. A test of independence revealed that the three conditions did not differ on whether participants remained ($F_{treatment}$ = 25, $F_{comparison}$ = 30, $F_{control}$ = 25) or dropped out ($F_{treatment}$ = 4, $F_{comparison}$ = 3, $F_{control}$ = 4) of the study, $\chi^2(2)$ = 1.29, p = .53, Cramer's V = .12.
2. A test of independence revealed that men and women did not differ across the experimental (F_{men} = 7, F_{women} = 18), comparison (F_{men} = 10, F_{women} = 20), or control (F_{men} = 10, F_{women} = 15) conditions, $\chi^2(2)$ = .81, p = .67, Cramer's V = .10.
3. Predicted pathways among these four variables based on the investment model were explored using linear regressions. At T_1, relational satisfaction and investment significantly predicted commitment, but quality of alternatives did not. At T_2, relational satisfaction and quality of alternatives significantly predicted commitment, but investment did not.
4. In addition to the Likert-type items measured in the manipulation check scale, behavioral frequencies of cuddling behavior (i.e., days a week, frequency a week, and cuddle duration) and shared meal time (i.e., days a week eating together, duration of eating together, and days a week cooking together) were also measured at T_1 and T_2. Behavioral frequencies from T_1 and T_2 were in the expected directions except for the cuddle duration item. That is, only participants in the treatment condition reported an increase in how many days a week they cuddled as well as how often they cuddled, as compared to the comparison and control condition. Additionally, only participants in the comparison condition reported eating together more days during the week, increasing the duration of their eating, and increasing cooking time together compared to the treatment and control condition. Contact the first author for these scores.
5. We thank a reviewer for the observation that the instructions may, or may not, have elicited changes only in cuddling behavior.

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