Journal of Experimental Social Psychology xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Journal of Experimental Social Psychology

journal homepage: www.elsevier.com/locate/jesp

Food loves company: Risky eating with friends increases interpersonal closeness☆

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ARTICLE INFO

Keywords:
Eating
Health behavior
Personal relationships
Risk taking

ABSTRACT

Risky eating—that is, indulging in ultra-processed, high-calorie foods including sweets, salty snacks, and/or fried foods—harms physical health. Yet, risky eating is pervasive with many people unwilling to give it up. Why do people engage in risky eating despite known risks? The current research tests a novel hypothesis that engaging in risky eating with friends increases feelings of interpersonal closeness. In Study 1, participants (N = 385) reported how often they engaged in risky eating in three non-romantic/non-familial relationships with varying degrees of interpersonal closeness. Individuals more frequently engaged in risky eating in their closer relationships than in their less close ones. In Study 2, participants (N = 100) were randomly assigned to perceive they were engaging in high-risk versus low-risk eating behavior with a friend. They then reported feelings of interpersonal closeness as well as chose how close to sit to their friend. Individuals who were randomly assigned to perceive they were engaging in high-risk eating behavior with a friend reported increased feelings of interpersonal closeness. Also, restrained eaters in the high-risk eating behavior condition reported greater feelings of interpersonal closeness while eating, which was mediated by increased feelings of activated positive affect (e.g., excited, alert). No effect on how close participants sat to their friend was observed. Overall, the current research highlights a previously unstudied pathway from risky eating to excitement to feelings of interpersonal closeness. This provides insight into one psychosocial process that may undermine personal and public health efforts.

1. Introduction

Every day U.S. Americans are eating ultra-processed, high-calorie foods. It is estimated that the typical person in the U.S. eats ultra-processed foods including sweets, salty snacks, and fried foods so often that these foods make up 57.9% of his/her diet (Martínez Steele et al., 2016). Diets consisting of these foods contribute to chronic disease risk (Micha et al., 2017), mortality risk (Mokdad, Marks, Stroup, & Gerberding, 2004), and lower health-related quality of life (Blanchard, Courneya, & Stein, 2008). The pervasiveness and harmfulness of eating ultra-processed, high-calorie foods may seem intractable, especially given that personal and public health efforts rarely inspire individuals to give up these foods and maintain healthy eating behavior. For example, a meta-analysis of short-term, randomized controlled trials of low-carbohydrate and low-fat/low-calorie diets indicated a high attrition rate (36%) across 13 studies (Hession, Rolland, Kulkarni, Wise, & Broom, 2009). However, using a social psychological lens may provide novel insight into why people continue eating ultra-processed, high-calorie foods despite known risks.

Indeed, research suggests that an individual's eating behavior is intertwined with her or his friendships. Multiple naturalistic studies document that friends closer within a social network have more similar eating behavior (Crandall, 1988; De la Haye, Robins, Mohr, & Wilson, 2010; Fletcher, Bonell, & Sorhaindo, 2011). For instance, one study indicated that fast food consumption among youth clustered within close friend groups (De la Haye et al., 2010). Although social psychologists have experimentally tested how friends can cause changes in eating behavior (Howland, Hunger, & Mann, 2012; Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007), research has yet to focus on the other, potential causal direction of effect between eating behavior and friendships. That is, might eating with friends increase feelings of interpersonal closeness, or interconnectedness between others (Aron, Aron, & Smollan, 1992)? This is an important question to answer because there may exist a positive feedback loop wherein friends

☆ This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Jenna R. Cummings was supported by a National Science Foundation Graduate Research Fellowship (DGE-1144087). The authors would like to acknowledge the hard work of Alyssa K. Choi, Lindsay Hong, and Megan Tan in collecting data for the current research.

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https://doi.org/10.1016/j.jesp.2018.07.006
Received 15 November 2017; Received in revised form 26 June 2018; Accepted 18 July 2018

influence each other's eating behavior, eating with friends affects feelings of interpersonal closeness in the friendship, and changed feelings of interpersonal closeness strengthens any impact friends have on each other's eating behavior.

The current research proposes that specifically *risky* eating—defined as indulging in ultra-processed, high-calorie foods including sweets, salty snacks, and/or fried foods—with friends increases feelings of interpersonal closeness. Although the current research is (to our knowledge) the first scientific test of this idea, Herman (2015) speculated that, "participating together in an episode in which behavioral restraints are lifted may create a greater fellow-feeling among group members" (p. 70). Understanding if and how risky eating with friends impacts feelings of interpersonal closeness is important because health behavior change interventions have aimed to increase risk perceptions of health-compromising behavior (Schwarzer, 1992) while ignoring how these risk perceptions and subsequent behavior change may impact social connections (Schwarzer, 2011).

It is also important to consider that, although some may not view eating as risky, eating ultra-processed, high-calorie foods in fact carries substantial risk. Nevertheless, different individuals may view eating as more or less risky (Schwarzer, 2011). In particular, individuals who chronically refrain from eating too much—termed dietary restraint—might view eating ultra-processed, high-calorie foods as riskier because they fear weight gain (Herman & Polivy, 1975; Lowe, 2002; van Strien, Frijters, Bergers, & Defares, 1986). These individuals may experience stronger feelings of interpersonal closeness from risky eating with friends because there would be greater indulgence. Herman's (2015) emphasis on "when behavioral restraints are lifted" as described above supports this notion (p. 70). Also, individuals scoring higher compared to lower in dietary restraint are generally more susceptible to situational effects involved in eating (Ruderman, 1986).

If risky eating does increase feelings of interpersonal closeness, what mechanism might explain such an effect? Self-expansion theory provides a potential explanation. This social psychological theory suggests that engaging in "exciting" behavior with others provides new opportunity for self-expansion and increases feelings of interpersonal closeness in existing relationships (Aron & Aron, 1996, p. 54). For example, researchers randomly assigned married couples to do activities the couple rated as exciting or pleasant each week for ten weeks. The couples who engaged in activities that they rated as exciting compared to pleasant increased in relationship satisfaction over time (Reissman, Aron, & Bergen, 1993). We speculate that engaging in risky eating with friends—especially when trying to avoid it—may be an exciting activity, thereby increasing feelings of interpersonal closeness.

Indeed, findings from neuroscience research support the idea that basic risky behavior with friends is exciting. The ventral striatum is part of the mesolimbic dopamine pathway, which is implicated in feelings of activated positive affect like excitement (Burgdorf & Panksepp, 2006; Volkow, Wang, Tomasi, & Baler, 2013). When people voluntarily take risks, their ventral striatum activates (Rao, Korczykowski, Pluta, Hoang, & Detre, 2008). And in one study participants played a virtual driving game in the presence of two friends or alone while undergoing fMRI scanning (friends, located in the scanner control room, communicated with the participant via intercom; Chein, Albert, Brien, Uckert, & Steinberg, 2011). When with friends, participants had greater activation in the ventral striatum while being riskier drivers. This finding suggests that engaging in risky behavior with friends increases sensitivity to the excitement of risky behavior.

1.1. Study 1

Given that no prior research has tested if engaging in risky eating with friends can change feelings of interpersonal closeness, we first examined if risky eating with others differed by degree of interpersonal closeness. We hypothesized individuals would engage in riskier eating in their closer relationships than in their less close ones. We report all measures, manipulations, and exclusions in this study. Data are publicly available on the Open Science Framework at https://osf.io/e2yza/.

2. Method

2.1. Participants

We recruited 408 individuals from Amazon's Mechanical Turk (MTurk) worker pool. This exceeded 0.95 power based on a power analysis conducted in G*Power Version 3.1.7 with an expected effect size of $d = 0.40$ and a correlation of $r = 0.50$ between time points. Since there were no prior studies on the current research topic, this expected effect size was based on a meta-analysis on psychosocial consequences of drinking alcohol, another potentially risky behavior where individuals consume substances (Hull & Bond, 1986). Data collection was not continued after data analysis. The inclusion criterion was at least age 21 and exclusion criteria were abstinence from eating palatable foods/drinks defined as sweets, salty snacks, fast foods, sugary drinks, and alcohol (Burgess, Turan, Lokken, Morse, & Boggiano, 2014). Participants were paid $0.25 for their time. Prior work suggests that even at low compensation rates, MTurk payment levels do not appear to affect data quality (Buhrmester, Kwang, & Gosling, 2011). However, we designed three quality control questions (e.g., "For this question, please mark the answer, 'Often.'") to identify participants who responded without reading the questions. Participants ($n = 23$) were excluded from analysis if they incorrectly answered any of these quality control questions.

The final sample comprised 385 participants (67.80% female). On average, participants were 35.36 years old ($SD = 12.29$, *Range* = 21–78). The sample was 81.60% White, 5.50% Black/African American, 5.20% Hispanic/Latino/a, 4.90% Asian/Asian American/Pacific Islander, 0.80% Native American, and 2.10% bi-racial. Average BMI was "overweight" at 27.37 ($SD = 6.27$, *Range* = 15.41–48.71). In the past 30 days, 17.10% of the sample ate at least one serving of palatable foods on all 30 days; 24.20% on 20–29 days; 27.80% on 10–19 days; 14.80% on 6–9 days; 10.40% on 3–5 days; 5.50% on 1–2 days; and 0.30% on no days. Average number of servings of palatable foods consumed on a typical day was 2.38 ($SD = 1.83$, *Range* = 1–20).

2.2. Procedure

The University Institutional Review Board approved the research procedure in accordance with the provisions of the World Medical Association Declaration of Helsinki. The study used a 3-level within-subjects design. Participants completed informed consent. Then, participants were asked to think about three non-romantic/non-familial relationships in their lives. Instructions stated that participants would answer the same questions for each relationship but before beginning participants should think about how they would comparatively rank these three relationships on perceived interpersonal closeness. Participants then answered the same questions about their closest, second closest, and least close other. Questions for each relationship included a manipulation check, demographics about the friend and the friendship length, and engagement in risky eating with the friend.

2.3. Measures

2.3.1. Manipulation check

Participants rated interpersonal closeness for each relationship on the Inclusion of Others in the Self Scale (IOS; Aron et al., 1992). The IOS has seven illustrations with circles that represent the self and the other with varied overlap. Participants selected the illustration that best represented their perception of how close they were to the other person in each relationship. We coded such that higher IOS scores reflected greater overlap, which reflected greater interpersonal closeness

(M = 3.25, SD = 1.76, *Range* = 1–7).

2.4. Frequency of risky eating with others

Participants reported the frequency of engaging in risky eating with others. Risky eating questions were answered on a 4-point Likert scale where 1 = "Never," 2 = "Occasionally," 3 = "Very Often," and 4 = "Always." Items began with the prompt, "When you two are spending time with one another, how often do you…" and included, "eat fast foods together?," "eat sweets or sugary drinks together?," and "eat salty snacks together?" A principal component analysis extracted one component from the risky eating questions (factor loadings > 0.78), therefore we scored a composite risky eating measure by computing the average (M = 2.09, SD = 0.63, *Range* = 1–4).

2.5. Covariates

Participants responded to questions on demographics about the friend and the friendship length. Participants reported their gender as well as the gender of each friend. We computed whether these genders matched or did not match. Participants also answered the question, "In a typical month, on how many days do you engage in some kind of behavior with your (closest/second closest/least close) other?" Responses included, "I only see this person at occasions like vacation," "About 1–2 days," "About 3–4 days," "About 6–9 days," "About 10–19 days," "About 20–28 days," and, "Almost every day of the month." Finally, participants answered the question, "How long have you known your (closest/second closest/least close) other?" Responses were recorded in year, months, and weeks and then converted into one composited estimate (in years).

We examined if same-gender friendship, frequency of hanging out in the past month, or length of friendship correlated with frequency of risky eating with others. Participants were more likely to engage in risky eating with others that they had known longer and hung out with more frequently in the past month, r = 0.14, p < .001 and r = 0.13, p < .001, respectively. These covariates were entered into their respective analyses. All results are presented over and above these effects.

2.6. Analytic plan

We conducted Repeated Measures Analysis of Variance (ANOVA) on frequency of risky eating with others. Relationship rank (closest vs. second closest vs. least close) was the within-subjects factor.

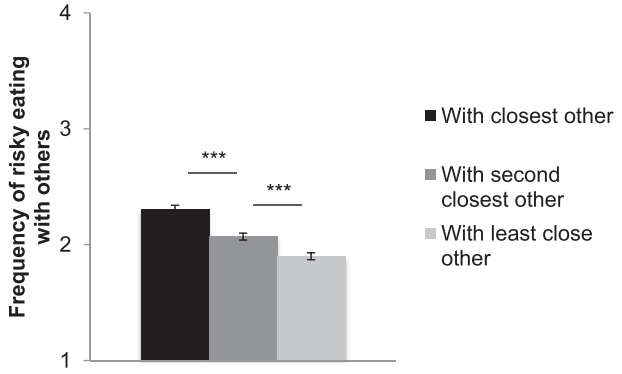

Fig. 1. Frequency of risky eating with others by relationship rank. Higher scores indicate greater frequency. *Note:* Capped lines represent standard errors. ***p < .001.

3. Results

3.1. Manipulation check

There was a main effect of relationship rank on the IOS, F(2, 766) = 251.06, p < .001, d = 1.62. Post-hoc pairwise comparisons confirmed that participants reported greater IOS scores for their closest (M = 4.29, SE = 0.09) compared to second closest other (M = 3.16, SE = 0.08), p < .001, 95%CI [0.99, 1.28], as well as least close other (M = 2.32, SE = 0.08), p < .001, 95%CI [1.77, 2.19]. Participants also reported greater IOS scores for their second closest compared to least close other, p < .001, 95%CI [0.68, 1.01].

3.2. Frequency of risky eating with others

We hypothesized that participants would engage in risky eating more frequently with their closest compared to second closest and least close other, and with their second closest compared to least close other. We found support for this hypothesis; there was a main effect of relationship rank on risky eating, F(2, 756) = 7.73, p = .006, d = 0.29.[1] Post-hoc pairwise comparisons confirmed that risky eating with closest others (M = 2.31, SE = 0.03) was more frequent than with second closest others (M = 2.07, SE = 0.03), p < .001, 95% CI [0.18, 0.30], and least close others (M = 1.90, SE = 0.03), p < .001, 95% CI [0.34, 0.48]. Also, risky eating with second closest others was more frequent than with least close others, p < .001, 95% CI [0.10, 0.23]. These results are displayed in Fig. 1.

4. Discussion

Study 1 showed that participants reported engaging in risky eating more frequently with others in their closest compared to least close relationships. These effects were observed controlling for covariates including length of friendship and frequency of hanging out in the past month. This study is limited, however, because causality cannot be established. That is, these results may reflect that closer friends influence each other to engage in risky eating or that engaging in risky eating increases interpersonal closeness in friendships. In Study 2, we therefore conducted an experiment to investigate the causal role of risky eating with friends in producing interpersonal closeness.

4.1. Study 2

We originated a laboratory paradigm wherein we manipulated risky eating with friends, testing effects on feelings of interpersonal closeness. Our main hypothesis was that engaging in risky eating with a friend would increase interpersonal closeness. We additionally measured the identified potential moderator—dietary restraint—and mediator—activated positive affect (e.g., excited, alert; Posner, Russeli, & Peterson, 2005). We thus secondarily hypothesized that risky eating with a friend would increase interpersonal closeness especially for those scoring higher in dietary restraint. Moreover, we secondarily hypothesized that risky eating with a friend would increase activated positive affect, especially for those scoring higher in dietary restraint, and this increased activated positive affect in turn would increase feelings of interpersonal closeness. We report all measures, manipulations, and exclusions in this study. Data are publicly available on the Open Science Framework at https://osf.io/e2yza/.

[1] Analysis conducted with out covariates indicated stronger effects, F(2, 768) = 73.50, p < .001, d = 0.88.

5. Method

5.1. Participants

We recruited 105 individuals from a public university in Southern California. This provided at least 0.90 power based on a power analysis conducted in G*Power Version 3.1.7 with an expected effect size of $d = 0.29$ and three tested predictors in multiple regression. The expected effect size was determined based on Study 1 results. Data collection was not continued after data analysis. Individuals participated for $5 or course credit. To limit floor effects and reduce the likelihood of any adverse events, inclusion criteria were student status and at least age 18 and exclusion criteria were strict diet, food allergies, and history of an eating disorder. Three participants were dropped due to failure of randomization (see procedure; 1 participant was in high-risk eating condition and 2 participants were in low-risk eating condition; data were not entered). Two participants were dropped due to researcher error (both participants found a piece of hair in milkshake; both participants were in high-risk eating condition; data were not entered). This left 100 participants (84% female).

On average, participants were 19.68 years old ($SD = 1.48$, *Range* = 18–27). The sample was 45.00% Asian/Asian American/Pacific Islander, 28.00% White, 14.00% Hispanic/Latino/a, 1.00% Black/African American, and 12.00% Bi-racial/other. The majority of the sample was heterosexual (91.00%). Average BMI was "normal" at 23.28 ($SD = 3.85$, *Range* = 16.47–38.47). In the past 30 days, 11.00% of the sample ate at least one serving of sweets, salty snacks, fast foods, or sugary drinks on all 30 days; 28.00% on 20–29 days; 25.00% on 10–19 days; 23.00% on 6–9 days; 7.00% on 3–5 days; 6.00% on 1–2 days; and 0.00% on no days. The average number of servings of sweets, salty snacks, fast foods, or sugary drinks consumed on a typical day was 1.83 ($SD = 0.94$, *Range* = 0.50–6.00).

5.2. Procedure

The University Institutional Review Board approved the research procedure in accordance with the provisions of the World Medical Association Declaration of Helsinki. The study design was a 2-level (high-risk versus low-risk eating) randomized between-subjects experiment. Participants nominated a non-romantic, same-gender friend to attend a "Consumer Rating Study" with them (the friend was separately screened to confirm eligibility). We used a rating paradigm so that participants would remain blind to the study's true purpose while being instructed to talk as well as eat together (Herman & Mack, 1975). Prior to the laboratory session, participants completed the IOS (Aron et al., 1992) online in reference to the friend that they nominated for the laboratory session. Participants also completed the Dutch Eating Behavior Questionnaire (van Strien et al., 1986) online.

Sessions were scheduled between 4 PM and 7 PM to coincide with eating norms in the U.S. The participant and the friend separately provided informed consent but—during this separated time—the friend was asked to work as a confederate. This friend/confederate was told that during the study the pair would have the opportunity to pick either an indulgent or a sensible milkshake to try, however both pair members must try the same milkshake. Then, the friend/confederate was randomly assigned to select the indulgent or sensible milkshake and was instructed to ensure that the pair selected that milkshake. The cover story for this instruction was that the study's actual purpose was to examine a friend's influence on an individual's consumer ratings. By using this cover story and design, the friend/confederate remained blind to the study's true purpose yet we were able to randomize pairs in a way that captured the experience of how risky behavior with friends unfolds in real-life. That is, the pair "chose" to engage in high-risk or low-risk eating behavior together.

5.3. Risk manipulation

The pair was reunited in a testing room that we designed to be similar to real-world settings in which people might eat with others: there was a couch for participants to sit at, side table with a potted plant, and colorful wall decorations. The pair was then told there were two available products: the indulgent and the sensible milkshake. These products were described as follows (similar to Crum, Corbin, Brownell, & Salovey, 2011):

- High-risk Eating: "Option 1, titled 'Decadence Delight,' is an indulgent milkshake. This product has 620 calories, and is a high-sugar, indulgent sweet. The description reads, 'Indulge yourself with this rich and creamy blend of all of our premium ingredients—sumptuously smooth ice cream, satin whole milk, and sweet vanilla. It is heaven in a bottle and irresistibly gratifying.'"
- Low-risk Eating: "Option 2, titled 'Sensi-shake,' is a sensible milkshake. This product has 140 calories, and is a low-sugar, sensible sweet. The description reads, 'Get sensible with the new light healthy Sensi-Shake. It has all the taste, without the guilt—no fat, no added sugar and only 140 calories! Sensi-Shake is light and tasty enough to enjoy every day.'"

The pair was told that they could pick either product but both pair members must try the same product. The pair made their decision privately, and it was expected that the friend/confederate would ensure the pair selected the product to which they were randomly assigned. The session was discretely video recorded and reviewed later to confirm any failure to the randomization; we excluded pairs if the friend/confederate did not follow or told the participant about the additional instructions.

Once the pair "chose" the product to try, the researcher served the milkshakes. Unbeknownst to the participants the milkshakes had an identical recipe, volume, and calorie count in both study conditions. The researcher instructed the pair on how to complete a product rating form. This form was not a measure for the study but instead intended to serve as a manipulation check, aid in study deception, and promote the avoidance of floor effects by forcing people to talk and try at least a little of the product (Herman & Mack, 1975). Pairs completed the product rating for ten minutes. After the rating, the researcher administered the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988).

Next, the researcher led the pair into a new testing room. On the way, the researcher instructed the participant and friend/confederate to bring ostensibly unused chairs from the hallway into the new testing room and "place the chairs anywhere you like." Then the participant completed a demographics questionnaire, answered a question on state-like feelings of interpersonal closeness while eating in reference to their friend/confederate, and completed the IOS for a second time in reference to their friend/confederate. Finally, the participant was debriefed—during which the friend was revealed to be working as a confederate—and compensated. The researcher measured distance between chairs when participants left.

5.4. Measures

5.4.1. Manipulation check

Pairs were asked on the product rating form, "How risky do you think eating this product is?" Responses were rated on a 7-point Likert scale ranging from 1 = "Not Risky," to 7 = "Extremely Risky" ($M = 4.68$, $SD = 1.01$, *Range* = 2–7).

5.4.2. Interpersonal closeness

We measured feelings of interpersonal closeness through self-report and behavior. Participants first answered a question on state-like interpersonal closeness while eating: "How close did you feel to your

partner when you were eating the milkshake together?" Participants responded on an 11-point Likert scale (0 = "Not at all" and 10 = "Very close"). Higher scores reflected greater interpersonal closeness while eating (M = 6.91, SD = 1.74, $Range$ = 2–10). Participants also reported pre- and post-study on the IOS, which is described in full in Study 1 (Aron et al., 1992). Greater IOS scores indicated greater interpersonal closeness (M_{pre} = 4.30, SD_{pre} = 1.57, $Range_{pre}$ = 1–7; M_{post} = 4.65, SD_{post} = 1.49, $Range_{post}$ = 1–7). The interpersonal closeness while eating scores moderately correlated with the IOS scores post-study, r = 0.40, $p < .001$. This suggests that the state-like measure had validity but also uniquely captured feelings of interpersonal closeness while eating.

Participants also chose how close to place their chair to their friend and physical distance between individuals may indicate interpersonal closeness (Aiello & Cooper, 1972). Less chair distance reflected greater interpersonal closeness (M = 26.91 in., SD = 7.09 in., $Range$ = 0.00–46.00 in.).

5.4.3. Dietary restraint

The Dutch Eating Behavior Questionnaire (DEBQ; van Strien et al., 1986) assesses patterns in eating behavior. Items were rated on a 5-point Likert scale (1 = "Never" to 5 = "Very Often"). We scored the dietary restraint subscale. Sample items include, "Do you try to eat less at mealtimes than you would like to eat?" and, "When you have eaten too much, do you eat less than usual the following days?" Higher scores indicated greater dietary restraint (M = 2.83, SD = 0.72, $Range$ = 1.00–4.40, α = 0.89).

5.4.4. Activated positive affect

The Positive Affect and Negative Affect Schedule (PANAS; Watson et al., 1988) assesses the degree of a participant's positive and negative affect in his/her current state. The scale includes 20 items and is responded on a Likert scale from 1 = "Very slightly or not at all" to 5 = "Extremely." An example item is: "Indicate to what extent you currently feel excited." We scored the activated positive affect items including active, alert, attentive, enthusiastic, excited, and happy (Posner et al., 2005). Higher scores indicated greater activated positive affect (M = 2.78, SD = 0.83, $Range$ = 1.17–4.33, α = 0.82).

5.5. Covariates

We examined if age, gender, ethnicity, sexual orientation, or BMI significantly correlated with any interpersonal closeness measure. Participants with higher BMIs sat farther away from their friends, r = 0.25, p = .014. This covariate was entered into its respective analyses, and results are presented over and above this effect.

5.6. Analytic plan

We tested our hypotheses using multiple regression models via SPSS, Version 23. We dummy coded risk level (low-risk = 0, high-risk = 1). For the model testing effects on the post-study Inclusion of Others of Self Scale, we controlled for pre-study levels by entering these as a covariate. To test for moderation, we created an interaction variable by taking the cross-product of the dummy coded risk level and the continuous dietary restraint score. To test for mediation, we used the SPSS PROCESS macro (Hayes, 2013). We used 10,000 bootstrap samples to create 95% bias-corrected and accelerated (BCa) confidence intervals to test the significance of indirect effects. Indirect effects are significant at $p < .05$ if the 95% confidence interval does not include zero.

6. Results

Table 1 provides means and standard deviations of the manipulation check and dependent variables by experimental condition. Table 1 also presents the standardized coefficients and p-values from the manipulation check and hypothesis testing for main effects. Other estimates (unstandardized coefficients, standard errors, confidence intervals, effect sizes) from hypothesis testing for main effects are provided in text.

Table 1
Means and standard deviations by experimental condition.

	Low-risk eating n = 51		High-risk eating n = 49			
	Mean	SD	Mean	SD	β	p
Risk rating (Manipulation check)	4.25	1.01	5.12	0.81	0.44	< .001
Interpersonal closeness while eating	6.61	1.59	7.22	1.84	0.18	.076
Post-study inclusion of others in the Self Scale	4.41	1.22	4.90	1.71	0.10	.037
Chair distance	27.73	7.85	26.06	6.16	−0.14	.156

6.1. Manipulation check

Participants in the high-risk compared to low-risk eating condition rated eating the product as more risky, $B(SE_B)$ = 0.88(0.18), β = 0.44, $p < .001$, 95% CI [0.51, 1.24], R^2 = 0.19.

6.2. Interpersonal closeness

We hypothesized that if participants perceived that they were engaging in high-risk compared to low-risk eating behavior with a friend they would demonstrate increased interpersonal closeness. There was a trend wherein participants who were randomly assigned to perceive that they engaged in high-risk compared to low-risk eating behavior with a friend reported greater feelings of interpersonal closeness while eating, $B(SE_B)$ = 0.62(0.34), β = 0.18, p = .076, 95% CI [−0.07, 1.30], R^2 = 0.03.

Participants who were randomly assigned to perceive that they engaged in high-risk compared to low-risk eating behavior with a friend reported significantly greater feelings of interpersonal closeness on the post-study Inclusion of Others in the Self Scale, $B(SE_B)$ = 0.30(0.14), β = 0.10, p = .037, 95% CI [0.02, 0.57], $R^2\Delta$ = 0.01. This result is presented in Fig. 2. There was no main effect of risky eating behavior with a friend on chair distance, $B(SE_B)$ = −1.97(1.38), β = −0.14, p = .16, 95% CI [−4.71, 0.77], $R^2\Delta$ = 0.02.[2]

6.2.1. By restraint

We hypothesized that dietary restraint would amplify effects of high-risk eating behavior with a friend on interpersonal closeness. Individuals scoring higher in dietary restraint who were randomly assigned to perceive that they engaged in high-risk compared to low-risk eating behavior with a friend demonstrated greater feelings of interpersonal closeness while eating, $B(SE_B)$ = 1.08(0.48), β = 0.91, p = .026, 95% CI [0.13, 2.02], $R^2\Delta$ = 0.05. A Pothoff extension of the Johnson-Neyman procedure indicated that the effect became significant at $p < .05$ for a DEBQ Restraint score of 0.02 above the mean (DEBQ Restraint = 2.85). The significance of the effect remained and strengthened for any DEBQ score above this. For example, for the highest DEBQ score in our sample (1.57 above the mean; DEBQ Restraint = 4.40) the effect was significant at p = .006. For ease of presentation, we dichotomized dietary restraint based on a DEBQ

[2] Analysis conducted with out the covariate also indicated no main effect on chair distance, $B(SE_B)$ = −1.66(1.42), β = −0.12, p = .24, 95% CI [−4.47, 1.14], $R^2\Delta$ = 0.01.

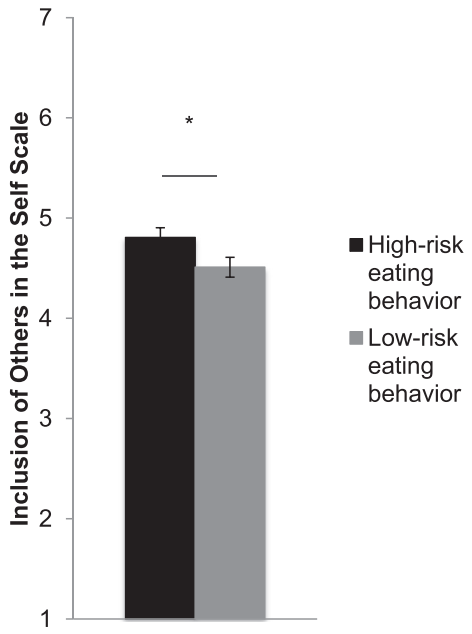

Fig. 2. The effect of high-risk versus low-risk eating behavior with a friend on feelings of interpersonal closeness as measured by the Inclusion of Others in Self Scale. Higher scores indicate greater feelings of interpersonal closeness as measured by the Inclusion of Others in the Self Scale. *Note:* Capped lines represent standard errors. *$p < .05$.

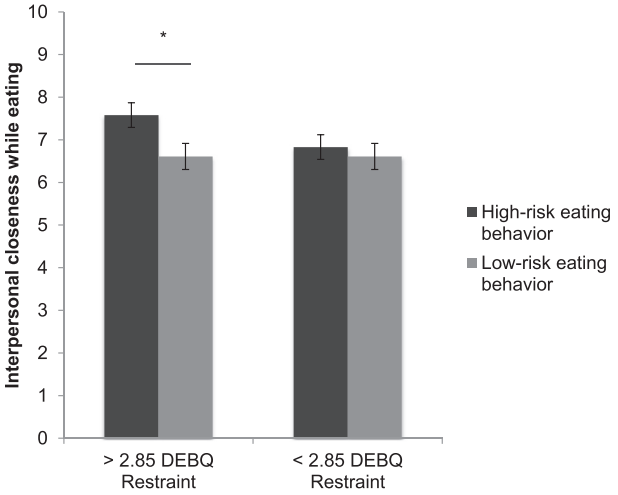

Fig. 3. Restrained eating moderated the effect of high-risk versus low-risk eating behavior with a friend on feelings of interpersonal closeness while eating. Higher scores indicate greater feelings of interpersonal closeness while eating. *Note:* Capped lines represent standard errors. The original analysis used dietary restraint as a continuous predictor, however, a Pothoff extension of the Johnson-Neyman procedure indicated that the effect became significant at $p < .05$ for a DEBQ Restraint score of 2.85. For ease of presentation, we dichotomized dietary restraint based on this score.

Restraint score of 2.85 to graph results in Fig. 3.

There was neither an interaction of risky eating behavior with a friend and dietary restraint on the post-study Inclusion of the Others in the Self Scale, $B(SE_B) = -0.20(0.20)$, $\beta = -0.19$, $p = .33$, 95% CI [−0.59, 0.20], $R^2\Delta = 0.002$, nor on chair distance, $B(SE_B) = -1.05(1.96)$, $\beta = -0.22$, $p = .59$, 95% CI [−4.94, 2.84], $R^2\Delta = 0.003$.[3]

6.2.2. Activated positive affect mediation

We hypothesized that high-risk eating would increase activated positive affect, especially for those scoring higher in dietary restraint, and this increased activated positive affect in turn would increase interpersonal closeness (first stage moderated mediation; PROCESS Model 7). We tested for first stage moderated mediation in the effect of high-risk eating on interpersonal closeness while eating because with that measure we found support for moderation. Indeed, the indirect effect of high-risk eating moderated by dietary restraint on interpersonal closeness while eating through activated positive affect was significant, 95% BCa CI [0.04, 0.72]. This first stage moderated mediation model with full path estimates is presented in Fig. 4.

We also tested for mediation in the effect of high-risk eating on increased feelings of interpersonal closeness as measured by the post-study Inclusion of Others in the Self Scale (PROCESS Model 4). This was to test if the effect of high-risk eating on increased interpersonal closeness was mediated by activated positive affect, without moderation by dietary restraint scores. However, the indirect effect of high risk eating behavior on interpersonal closeness through activated positive affect was not significant, 95% BCa CI [−0.06, 0.02].

7. Discussion

Study 2 showed that individuals who were randomly assigned to perceive that they engaged in high-risk versus low-risk eating with a friend experienced increased feelings of interpersonal closeness. This provides causal support for our main hypothesis. Also, for those scoring higher in dietary restraint, being randomly assigned to perceive engagement in high-risk eating with a friend predicted increased feelings of interpersonal closeness while eating. Moreover, for those scoring higher in dietary restraint, being randomly assigned to perceive engagement in high-risk eating with a friend predicted increased activated positive affect, which in turn predicted increased feelings of interpersonal closeness while eating.

8. General discussion

We found support for our main hypothesis that engaging in risky eating with friends increases feelings of interpersonal closeness. Study 1 documented that individuals more frequently engaged in risky eating in their closer relationships than in their less close ones. Study 2 showed that individuals had increased feelings of interpersonal closeness when they were randomly assigned to perceive they were engaging in high-risk versus low-risk eating with a friend. Taken together, this research sheds light on one reason why people may be motivated to eat ultra-processed, high-calorie foods including sweets, salty snacks, and/or fried foods.

Study 2 also showed that, for those scoring higher in dietary restraint, or chronic restraint from over-eating because of fear of weight gain, being randomly assigned to perceive engagement in high-risk eating with a friend predicted increased feelings of interpersonal closeness while eating. These increased feelings of interpersonal closeness while eating were predicted by increased feelings of activated positive affect. This suggests that—when afraid of the consequences—engaging in risky eating with friends may be exciting, which (in accordance with self-expansion theory) may increase interpersonal closeness. It is important to note, however, that Study 2 had limited statistical power for

[3] Analysis conducted with out the covariate also indicated no interaction of risky eating behavior with a friend and dietary restraint on chair distance, $B(SE_B) = -1.18(2.01)$, $\beta = -0.24$, $p = .56$, 95% CI [−5.17, 2.82], $R^2\Delta = 0.003$.

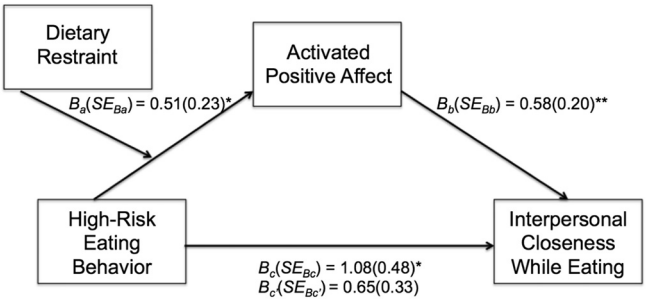

Fig. 4. Activated positive affect mediated the effect of high-risk versus low-risk eating behavior with a friend moderated by dietary restraint on feelings of interpersonal closeness while eating. *Note:* $^*p < .05$, $^{**}p < .01$.

testing moderated mediation, which may bias this particular result (Schoemann, Boulton, & Short, 2017).

In addition, results from Study 2 indicated a direct effect of risky eating on interpersonal closeness that was unaccounted for by dietary restraint and activated positive affect. In detail, those scoring lower in dietary restraint did not have increased feelings of activated positive affect when they were randomly assigned to perceive they were engaging in high-risk versus low-risk eating with a friend. One reason for this may be that high-risk eating only evoked feelings of activated positive affect when individuals consciously considered that they were violating personal eating goals—goals that those low in dietary restraint by definition do not have. Another reason may be that a self-report method was not sensitive enough to capture feelings of activated positive affect for all participants; indeed, prior work measures the effects of risky behavior on activated positive affect using sensitive brain imaging techniques (Chein et al., 2011; Rao et al., 2008). Thus, future extensions of the current work could include more precise measurement of mediators that may explain the effect of risky eating with a friend on interpersonal closeness independent of dietary restraint and activated positive affect.

The current research builds theory in health psychology. Health behavior theories—which include theories of risky behavior like indulging in ultra-processed, high-calorie foods including sweets, salty snacks, and/or fried foods—focus on an individual's beliefs and self-regulation abilities (Schwarzer, 2011). Although some incorporate the concept of social norms, none take into account how behavior change impacts social connections. As people are driven by a basic motivation to connect with others (Baumeister & Leary, 1995), examining these effects is imperative. Moreover, some health behavior theories, such as the Health Action Process Approach (Schwarzer, 1992), suggest that people change their behavior when they view it as riskier so increasing risk perceptions should be an intervention target. The current research findings imply this approach could have unintended psychosocial consequences. For instance, if someone views indulging in ultra-processed, high-calorie foods including sweets, salty snacks, and/or fried foods as riskier, they may more greatly enjoy eating these foods with friends.

The current research results should be interpreted while considering the following. In Study 1, we measured how frequently individuals engage in risky eating with questions and a scale we created. The validity of these questions and the scale has not been established, and a 4-point scale may have limited response variability. In addition, although the intent of Study 1 was to establish if risky eating with others differed by degree of interpersonal closeness, no causal direction of effect can be established from those data alone. Multiple naturalistic studies document tight associations between eating behavior and close friendships (Crandall, 1988; De la Haye et al., 2010; Fletcher et al., 2011) and the observed effects from Study 2 of the current research were small. This suggests of bidirectional effects between risky eating and the level of interpersonal closeness in friendships. Indeed, a future experiment that tests the effects of others with varied degrees of interpersonal closeness (e.g., the effect of strangers vs. coworkers vs. close friends) on the likelihood of risky eating would be another good avenue for future research.

Additionally, the observed effects in Study 2 also did not appear consistently for all interpersonal closeness measures. Chair distance might not have been sensitive enough to capture effects because participants were already in established friendships, and chair distance in particular may be better fit for measuring discrimination effects (Goff, Steele, & Davies, 2008). Moreover, we observed direct effects of risky eating on the Inclusion of Others in the Self Scale but indirect moderated effects on state-like interpersonal closeness. This divergence could be due to the different timeframe for these measures. For those high in dietary restraint, asking specifically about interpersonal closeness felt *during* the risky eating rather than general interpersonal closeness by the end of the study may have more closely related to when they felt most excited. Those feelings of excitement may have been very transient.

Another limitation to consider is that Study 1 and 2 samples were predominately composed of one ethnicity (i.e., predominately White and predominately Asian/Asian American/Pacific Islander, respectively). The low diversity in the study samples prevents broad generalizability of results. Although there was a lack of any a priori, theoretical reason to expect effects to differ between ethnicities in the current research, future research may want to explore such effects in more diverse samples. Lastly, in the current research we use the terms “indulging in” and “indulgent” when defining and manipulating risky eating. However, risky eating and indulgence may be two unique constructs. The current research specifically focused on risky eating (e.g., “How risky do you think eating this product is?”). Future research can expand from this by separately measuring indulgence (e.g., “How much do you feel you are indulging right now?”), and testing the convergence and divergence between risky eating and indulgence. Since the current research findings found that dietary restraint moderated effects, it may also be important to test for this convergence and divergence while considering individuals' dieting statuses.

Limitations notwithstanding, Study 2 used a unique paradigm with high ecological validity where participants *perceived* they chose to engage in risky eating with a friend but actually the risky choice was randomized by recruiting the friend to be a confederate. Furthermore, the milkshake eaten was identical across conditions. This maximized internal validity, ruling out the effect of other confounding factors (e.g., better tasting food, different physiological effects of food) on feelings of interpersonal closeness. This also suggests the observed effects may be explained by beliefs, expectations, or mindsets about high-risk versus low-risk eating (Raghunathan, Naylor, & Hoyer, 2006; Turnwald, Jurafsky, Conner, & Crum, 2017) rather than the eating behavior itself. Perhaps if a healthy food was described similarly to the ‘Decadence Delight’ in the current research, eating a healthy food with a friend could also increase feelings of interpersonal closeness. This could be a potentially critical future research area. Certainly, in a qualitative analysis of 26 menus from top-selling U.S. chain restaurants, researchers found that healthy food items were described as less exciting, fun, and indulgent than other items (Turnwald et al., 2017).

Although the current research focused on the effect of risky eating on feelings of interpersonal closeness, it is also possible that engaging in other types of risky behavior with friends may also increase interpersonal closeness. Laboratory research certainly shows that risky behavior is exciting (Rao et al., 2008) and that the presence of friends increases the sensitivity to the excitement of risky behavior (Chein et al., 2011). The excitement from engaging in any risky behavior with friends may lead to increased feelings of interpersonal closeness. As not all risky behavior is ethical to manipulate, future observational designs could provide further insight. For example, researchers could ask friends to report on different risky behaviors done together (e.g., risky eating, binge drinking, using illicit drugs) and interpersonal closeness

over several time points.

The current research results have real-world application. Many people hang out with friends at restaurants, and people eat more food when with others (Herman, 2015). Our results imply a positive feedback loop relevant to personal health efforts: a person trying to eat less ultra-processed, high-calorie foods may feel closer to a friend after indulging in these foods together, then this person may hang out with the friend more, then hanging out more may lead to more indulging in food, which may lead to an even closer friendship and so forth. Also, public health efforts such as Michelle Obama's “Let's Move!” campaign have aimed to increase risk perceptions of ultra-processed, high-calorie foods such as sweets, salty snacks, and/or fried foods in hopes of encouraging healthier eating in the U.S. These efforts have large budgets but may have unintended psychosocial consequences that detract from the public health intent. Understanding interpersonal processes coupled with risky behavior provides valuable insight into one psychosocial phenomenon that may undermine personal and public health efforts.

Furthermore, research on how health-compromising and health-promoting behaviors impact social connection may improve the efficacy of health behavior change interventions as well as encourage interventions that break positive feedback loops between friendship and risky behavior. An example of this kind of intervention is the community reinforcement approach used in the treatment of substance use (see Roozen et al., 2004 for a systematic review). In this approach, counselors encourage an individual to spend more time with friends who don't use substances as well as to invite friends who do use substances to engage in alternative social activities with him or her. The current research suggests that, when using this kind of approach to change eating behavior, the effect of the behavior change on friendship quality should be monitored. There may exist a delicate balance between keeping one's friendships strong and changing one's eating behavior.

Finally, the current research advances the study of health in context. Specifically, this study is novel in its test of not how a psychosocial context impacts engaging in a health-compromising behavior but how engaging in a health-compromising behavior impacts the experience of that psychosocial context. However, this study only addresses one specific health-compromising behavior in one specific psychosocial context (i.e., risky eating in friendships). It is important that researchers recognize the many other health-compromising behaviors (e.g., alcohol use, smoking cigarettes, having unprotected sex) occur in many other contexts related to personal relationships (e.g., situations in romantic relationships, situations in parent-child relationships). Future research studying each of these behaviors in each of these psychosocial contexts may provide novel insight on why individuals have a hard time changing behavior from day-to-day—because personal relationships influence day-to-day behavior (e.g., Crandall, 1988; De la Haye et al., 2010; Fletcher et al., 2011). As the literature crossing social psychology and health behavior theory grows, these insights could help behavior change efforts become more generalizable across contexts.

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