Touch as a Stress Buffer? Gender Differences in Subjective and Physiological Responses to Partner and Stranger Touch

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Gender Differences in the Stress-Buffering Effect of Touch

Abstract

Accumulating evidence indicates that interpersonal touch is beneficial for well-being. One important mechanism underlying these benefits appears to be that touch buffers stress reactivity under challenging conditions. The evidence is clear when it comes to touch within romantic relationships. However, contradictory results emerge with respect to touch from strangers. We propose that this may stem from important moderations by gender that emerge in interactions between strangers. We hypothesized that for romantic relationships, partner touch would have a similar stress-buffering effect for both genders, but for strangers this effect would be stronger for men than women who received touch from an opposite-gender stranger. Participants took part in a facial emotion recognition task and received false failure feedback. We assessed baseline and post-test emotional state and cardiovascular activity (heart rate frequency and variability). Romantic partner touch had a similar stress-buffering effect in both genders on the subjective level. However, touch from an opposite-gender stranger had a stress-buffering effect only on men’s emotional reactions, but not women’s. For women, touch by strangers of opposite-gender not only failed to attenuate physiological strain, but it also increased it. This underlines the role of gender when investigating the benefits of touch during stress in unacquainted relationships.

Keywords: touch, gender, stress, heart rate, heart rate variability.
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Touch as a Stress Buffer? Gender Differences in Subjective and Physiological Responses to Partner and Stranger Touch

Accumulating research indicates that physical proximity, in particular touch, contributes to well-being (Jakubiak & Feeney, 2017). Moreover, touch appears to play a particularly important stress-buffering role during challenging contexts (e.g. Coan et al., 2017; Coan, Schaefer, & Davidson, 2006). However, even though several studies indicate that men and women approach touch differently (e.g. Hanzal et al., 2008; Major et al., 1990), no study has systematically examined gender differences in the reaction to touch under stressful conditions. In addition, there is reason to believe that the influence of gender may vary depending on the type of relationship. In particular, gender differences appear to be less pronounced within close relationships than among strangers (e.g. Heslin et al., 1983; Lee & Guerrero, 2001). Therefore, the present study aims to examine whether physical touch buffers against psychological and physiological stress reactions similarly across genders for both romantic partners and strangers.

Touch and Well-Being

Touch is a very common and important interpersonal behavior in close relationships throughout the lifespan. Accumulating research indicates that it is not only associated with psychological, relational and physical well-being, but that it can causally increase well-being (for a review, see Jakubiak & Feeney, 2017). There is strong evidence for the benefits of touch from a romantic partner with regard to psychological well-being. An ecological momentary assessment study showed that daily touch behaviors predict subsequent increases in momentary positive affect (Debrot et al., 2013). That same study showed that the total amount of daily touch during the assessment period was associated with increases
in partner psychological well-being six months later. Partner touch also reduces the subjective experience of strain (i.e. the individual reaction to stressors; Dewe et al., 2012) both assessed globally (Floyd et al., 2009) and on a daily basis (Burleson et al., 2007). During a stress induction, partner touch made people who were recounting a personal moment of stress feel less stressed and more self-confident after the discussion (Jakubiak & Feeney, 2019). These effects even hold for imagined touch. In two experiments, participants provided lower pain ratings and reported less stress when imagining that their partner was touching them in stress-inducing situations (Jakubiak & Feeney, 2016).

In addition to subjective experiences of stress, many studies indicate that partner touch reduces stress-related physiological activation. Handholding supports a more favorable neural activation in reaction to a physical threat (Coan et al., 2006; Coan et al., 2017). Instructed partner hugs diminish blood pressure (Light et al., 2005) and spontaneous partner touch accelerates cortisol recovery after a social stressor (e.g. Ditzen et al., 2019). In a sample of women, Ditzen et al. (2007) found that having positive physical partner contact before a social stress induction led to significantly lower heart rate responses. Similarly, warm partner contact before social stress induction was related to lower blood pressure and heart rate reactivity to the stressor (Grewen et al., 2003). Further, recent research indicated that being stroked by one’s partner reduces heart rate, as opposed to stroking the partner or self-stroking (Triscoli, Croy, Olausson, & Sailer, 2017). Likewise, participants exhibited less subjective and observer-coded stress in a real or imagined conflict discussion with their romantic partner when they touched them or imagined touching them (Jakubiak & Feeney, 2018).
However, these clear benefits of touch for romantic partners do not consistently generalize to touch among strangers. For example, two studies demonstrate greater attenuation of the neural response to stress when a spouse compared to a stranger provided touch (Coan et al.; Coan et al., 2017). In addition, even when touch was always provided by an experimenter, when participants believed it was their partner who touched them, the touch was perceived as more pleasant than when they believed a stranger had touched them (Kreuder et al., 2017). One potential mechanism is that strangers are less able than the partner to provide emotional support, because there is far less self/other overlap with strangers than with the partner (Beckes et al., 2013). Finally, Vrana and Rollock (1998) found that being touched by an experimenter reduced heart rate, a sign of physiological calming, but increased skin conductance, a sign of physiological arousal. Hence, research indicates that touch may not hold the same benefits when occurring outside of close relationships.

**Gender Differences in Touch**

While evidence of the benefits of touch within romantic relationships is accumulating, it is unclear whether these effects are the same for men and women. Some work suggests that there may be important differences related to gender. Major et al. (1990) reported that men are more likely to touch their partner, when not in highly ritualized context (e.g. greeting or leave-taking settings). However, relationship status may affect these differences, as men tended to initiate touch more when in casual relationships, whereas women did more so in married relationships (Guerrero and Andersen, 1994). Men also appear to appraise touch more positively than women. For example, Hanzal et al. (2008) found that men had uniformly more positive reactions to touch from their partner.
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than women. Moreover, touch was more important for men’s relationship quality than for women (Miron et al., 2018).

However, despite more frequent initiation and more positive views of touch by men, the emotional and physiological outcomes of receiving touch within romantic relationships appear similar across genders. Indeed, daily touch is associated with an improvement of momentary affective state for both genders (Debrot et al., 2013; Debrot et al., 2017). Receiving touch also was shown to reduce cortisol secretion and accelerate cortisol recovery as well as to lower heart rate and blood pressure during stress exposure in similar way for men and women (Ditzen et al., 2008; Ditzen et al., 2019). Moreover, after a four-week touch intervention, both genders exhibited similar increases in oxytocin, and decreases in cortisol and alpha amylase (Holt-Lunstad et al., 2008). Notably, in this study, men benefited more from this intervention for their blood pressure.

The emotional and physiological benefits across genders that come from receiving touch from a romantic partner become less consistent when looking at touch between strangers. Indeed, men generally rate touch from opposite-gender strangers more favorably than women. For example, touch from an opposite-gender stranger was considered as unpleasant by women, but quite pleasant by men (Heslin et al., 1983). These differences seem to hold even in the case of coercive touch. Struckman-Johnson and Struckman-Johnson (1993) found that, when rating vignettes where participants had to imagine receiving an uninvited genital touch from an opposite-gender college acquaintance, women anticipated strong negative effects, whereas men did not. Kirsch et al. (2018) showed that, men perceive that a caressing touch from an experimenter as rewarding, while women did not. Further, in the work context, workers perceived women’s touch as more benevolent
and men's as more indicative of romantic attraction (Lee & Guerrero, 2001), and, in a shopping context, accidental touch by an unknown other consumer was perceived negatively by both genders, especially so when the toucher was a man (Martin, 2012). Similarly, Suvilehto and colleagues (2015) found that people generally rated female touch as more pleasant than male touch. However, studies that examined touch from opposite-sex stranger when making a request found that both genders were more likely to respond positively to the request when touched (Brockner et al., 1982; Guéguen, 2007, 2010).

The results for the physiological consequences of touch between strangers seem even more complicated. Two studies indicate that same-gender touch has higher stress-reducing consequences for women than for men. First, Brockner et al. (1982) found that men had a higher increase in heart rate when touched by a same-sex experimenter than women. Second, heart rate decreased more strongly among women than men when touched by a same-gender experimenter (Vrana and Rollock, 1998). However, to our knowledge, no study has investigated the physiological reaction to opposite-gender touch. In sum, when gender differences are found in touch between strangers, they seem to indicate that men perceive opposite-gender touch more positively than women.

Taken together, these results indicate that gender differences might be particularly pronounced when comparing partner touch to stranger touch. To our knowledge, no study has yet investigated how the type of relationship interacts with gender to predict the reaction to touch. Therefore, we attempt to address this gap in the literature. We hypothesized that for romantic relationships, partner touch would have a similar stress-buffering effect in both genders, but for strangers this effect would be stronger for men who received touch from an opposite-gender partner than for women.
The Current Study

The present study aims to investigate whether touch buffers stress differently according to both the relationship with the toucher (romantic partner vs. stranger) and the gender of the touched person. First, we expect a main effect of touch in reducing the stress reaction. Second, we expect the effect of partner touch to be stronger than the effect of stranger touch in buffering stress. Third, we expect gender differences to interact with the type of relationship such that there would be no gender differences in the reaction to partner touch, while men would benefit more from opposite-gender stranger touch than women.

To test these hypotheses in a stress-inducing situation that is relevant to the participants, we provided a false failure feedback (van den Hout et al., 2001) to university-level participants at an emotion recognition task after having told them that this was a critical competence for academic and professional success. Indeed, high professional performance is highly valued in our post-industrialized cultural context (Walker & Caprar, 2019) and failing at a relevant task might be particularly stressful for the participants. We measured the subjective experience of stress in the form of self-reported emotions and objective markers of stress in the form of cardiovascular activation (increased heart rate; see Kudielka et al., 2004, and decreased heart rate variability; see Thayer et al., 2012).

Method

Participants

The recruitment was done in two phases. In a first phase, we recruited participants by giving a short presentation in several well-attended University classes (first year med school, law, etc.), posting ads and posters, sending emails to several colleges and
distributing (electronic) flyers. In the second phase (post-covid), we recruited in first-year psychology student class and informing acquaintances and via social media posts. We informed that the study was testing a new method assessing emotional competences to potentially integrate it in a new procedure to select university students. To participate: a) the participants had to be in romantic heterosexual relationship for at least three months, b) both partners had to participate, c) they needed to be between 18 and 40 years old, d) they had to have a high school degree. We excluded from participation people who had a seriously impairing illness, had a diagnosed psychological disorder or taking psychoactive drugs, or were parents. One hundred eleven couples (222 participants) took part in the study. They were between the ages of 19 and 36 years ($M=23.30$, $SD=3.27$), relationship length ranged from three months to 10 years ($M=30.55$, $SD=24.26$ months). Most participants were Swiss (70.0%), and had at least a high school certificate.

Procedure

After we had checked their participation criteria, participants filled out a first set of online questionnaires at home. Both partners then attended the lab together. A research assistant first informed them that the study aimed to test a new procedure to select university students by assessing their emotional competences. To increase the personal relevance of the task, they stressed the importance of emotional competence, not only for individual and relational well-being, but also for academic and professional success. Indeed, this is highly relevant for the social image and the success of students and is thus likely to provoke a stress reaction in case of failure (Dickerson et al., 2004). To justify that someone would touch them during the task, we told them that we also investigated whether another
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person’s presence could affect those competences. Participants then signed the informed consent form.

To exclude psychologically vulnerable participants due to the stressful nature of the task, participants completed the Brief Symptom Inventory (BSI; Franke, 2000). We aimed to exclude participants above the clinical cut-off for students (>63). However, because of this sample’s high mean score at the BSI ($M = 71.19$, $SD = 18.22$; 56.4% above cut-off), we provided feedback about their score and let participants decide whether they wanted to participate (see Supplementary Material B). They also received an information flyer with possibilities for psychotherapeutical support and signed a second informed consent. None of them retracted participation. Next, participants completed the subjective affective state measures and a visual analogue scale (VAS) assessing their performance expectations at the emotion recognition task.

Then we randomly assigned participants to one of three experimental conditions: 1) partner touch 2) stranger touch, or 3) control (no touch). Both people from the couple took part in the stressful task, so couples were also a priori randomly assigned to one of the following groups: a) male in partner touch condition, female in stranger touch condition, b) female in partner touch condition, male in stranger touch condition, and c) both partners in control condition. Next, for groups a) and b), the partner assigned to the stranger touch condition completed the experimental task while being touched by an opposite-gender research assistant. Meanwhile, the other partner completed another block of online questionnaires. The second partner completed the experimental task next, while the first partner touched them. In the control condition, we randomly assigned the completion order
of the experimental task. For a complete overview of the study design, see Supplementary Material D.

After connecting participants to Biopac Student Lab PRO 7.7.7 to assess the physiological parameters, we instructed them to sit quietly while hearing relaxing music to assess their baseline heart rate and heart rate variability for ten minutes. Then the partner, an opposite-gender confederate or nobody sat next to the participant and put their hand on the participant’s shoulder. We informed participants that the other person was looking in the opposite direction (to avoid the participant to feel judged about their bad feedback). Participants read the instructions to complete the experimental task (see Supplementary Material E). Next, the experimental task begun during which the stimuli were presented via Matlab (R2013b). The stimuli came from the Karolinska Directed Emotional Faces (Lundqvist et al., 1998), that comprises 36 distinct identities (18 males) each displaying six facial expressions (fear, anger, disgust, happy, sad, surprise) and a neutral expression, but had been modified to manipulate the signal strength (degree of blurredness; Rodger et al., 2015). We selected images that had a degree of blurredness close to the adult recognition threshold of each emotional expression, to have a difficulty level that made a hit or a miss credible.

First, participants completed one practice block where they received real direct feedback about their performance (wrong vs. right and time needed to complete). Then, they completed the eight experimental blocks. In each block, seven pictures corresponding to the seven emotional expressions (joy, fear, disgust, anger, surprise, sadness and neutral) appeared on a screen. Participants first saw a neutral screen with a fixation cross during 500 ms, then the emotional expression stimuli during 500 ms, and then a screen with the
written seven emotional expression options until participant’s response, for max. 10 seconds. After each block, participants received false feedback about their performance; a first screen with a graph showed their results at the last block, and from the second block on, a second screen with a graph showed their mean result at the whole task. For both screens, a second graph showed the mean result of a reference group that was clearly better (see Supplementary Material F). On average, participants needed 5 min 31 seconds to complete the nine blocks. Next, participants filled a second time the subjective affective state measures and a VAS about their expectancies at a similar test, as well as two VAS assessing how surprised and disappointed they were about their results (see van den Hout et al., 2001). Finally, we debriefed participants about the procedure (see Supplementary Material G).

Measures

Subjective Affective State Measures. We assessed momentary affective state with different measures. The 10-item I-PANAS-SF assesses positive and negative affect (Thompson, 2007; German translation based on Krohne et al., 1996; French translation based on Nicolas et al., 2014), ranging from 1 = not at all or little to 5 = extremely. The Self-Assessment Manikin (SAM; Bradley & Lang, 1994) assesses the valence and arousal dimensions of current affect on a scale ranging from 1 = very good to 9 = very bad (reverse coded) and on another scale from 1 = very agitated to 9 = very calm, respectively. Finally, a single item assessed momentary self-esteem (self-confident, ranging from 1 = not at all or little to 5 = extremely). Given the numerous items assessing momentary affective state, we a priori decided to conduct an Exploratory Factor Analyses (EFA) both at pre- and post-test to select the most relevant items. The EFA revealed no coherent picture at pre-test, likely
because several items were rarely endorsed (e.g. 91% of the participant reported not feeling upset at all). At post-test however, the best solution was a seven-item factor, $\alpha=.75$ (at pre-test $\alpha=.67$). The items represent subjective distress (nervous, low affective valence, ashamed, upset, affective arousal, anxious, and low self-confident).

**Physiological Measures.** Electrocardiogram (ECG) recordings were sampled at 1 kHz to measure heart rate at baseline and during the experimental task. A research assistant applied sensors to the skin in a Lead II configuration to gather ECG signals. We collected physiological signals using the MP 150 data acquisition and analysis systems (Kremer et al., 2010). To obtain the heart rate variability (HRV), we selected a three-minute segment of the ECG for each participant during the baseline (two minutes into the resting task), and during the experiment (first three minutes of the stress induction).

Interbeat-intervals (IBI, time between R spikes in the QRS complex of the heartbeat; Allen et al., 2007) were extracted from the 3-minutes segments of the ECG channel. We hand-corrected IBI series for artifacts (e.g., due to any movement or dropped signal). We a priori set a threshold to drop files requiring 20% of the file to be modified. As a result, we dropped 53 files (19%) because they surpassed our 20% threshold. In the remaining files, we made at least one modification in 49% of them, with an average of $M=11$ imputations (5.5%) per modified file. Next, we imported the IBI data into CMetX software (Allen et al., 2007). CMetX could not read 16 files, which we thus did not use. The final sample had the data from 113 participants at baseline, and 84 participants during the experiment.

High frequency heart rate variability (Hf-HRV), otherwise called respiratory sinus arrhythmia (RSA) was obtained by filtering these IBI through a high frequency band spectrum (0.12-0.4 Hz) at which respiration occurs using CMetX. CMetX logs this value
before providing a final output. Heart Rate in beats per minute (BPM) is also provided by CMetX.

Results

Data Analytic Strategy

To first check whether the stress manipulation worked, we conducted paired sample t-tests in SPSS, version 25 (IBM Corp.) of the affective state assessment and of the scale about the participants’ performance expectation at the emotion recognition task.

To test our hypotheses, we used multilevel modelling with MLwiN (Rabash et al., 2009) to take partners’ interdependence into account (Kenny & Kashy, 2011). We tested two-level models where partners were nested within couples. Using the Actor-Partner Interdependence Model (APIM), we computed two sets of parameters per couple—one for each gender (Kenny & Kashy, 2011). Intercepts were allowed to vary randomly across couples, and residual terms were correlated between partners at the couple level. All the models controlled for the outcome measure at baseline. To test our first hypothesis regarding the role of touch on the outcomes, we first ran APIMs where all the parameters were set equal across gender and condition. To test the second hypothesis, the experimental condition was a categorical predictor with the control condition as reference. Thus, the resulting parameters indicate the deviation from the control condition. To test the third hypothesis, we released the gender-equality constraints and conducted Chi-Square test to assess whether each parameter of the model differed significantly by gender.

Analyses

First, we conducted a manipulation check by testing whether the false failure feedback was successful in inducing distress in participants (see Table 1). Compared to pre-
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test measures, at post-test participants reported a worsened affective state, \( t(221) = -6.35, p < .001 \). Additionally, participants had lowered expectations toward their capacities at an emotion recognition task after the test compared to before, \( t(221) = 7.84, p < .001 \), confirming the success of our manipulation (see van den Hout et al., 2001).

Next, we tested our hypothesis that touch would buffer the negative effect of the stress induction, such that participants would feel less frustrated, have lower HR and higher Hf-HRV. Compared to the control condition, when touched, participants at post-test felt neither less distressed, \( b = -.13, SE = .10, p = .20 \), nor less HR, \( b = -.57, SE = 1.03, p = .58 \), nor less HRV, \( b = -.17, SE = .12, p = .16 \).

We then tested whether partner touch would have a stronger stress-buffering effect than stranger touch. Compared to the control condition, participants felt no difference in subjective distress at post-test neither when their partner touched them, \( b = -.13, SE = .11, p = .13 \), nor when participants were touched by an opposite sex-stranger, \( b = -.12, SE = .11, p = .27 \). Comparing the two touch conditions revealed no significant difference, \( \chi^2_{diff(1)} = .02, p = .45 \). HR did not differ when touched by one’s partner, \( b = -1.47, SE = 1.19, p = .22 \), nor when touched by a stranger, \( b = .16, SE = 1.14, p = .89 \). Comparing the two touch conditions revealed a marginally significant difference, \( \chi^2_{diff(1)} = 2.11, p = .07 \). Participants did not have a different HF-HRV when touched by their partner, \( b = -.11, SE = .13, p = .40 \), as compared to the control condition. When touched by a stranger, participants had marginally lower HF-HRV compared to the control condition, \( b = -.21, SE = .13, p = .09 \), indicating a trend toward experiencing more stressed when touch by a unknown person. However, as with the other outcomes, comparing the two touch conditions revealed no significant difference,
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χ²\text{diff}(1)=.76, p=.19. These analyses indicate that partner and stranger touch have a similar lack of stress-buffering effect.

Finally, we tested our third hypothesis that there would be an interaction between gender and touch condition. When touched by their partner, women had a lower post-test HRV than women in the control condition, \(b= -.48, SE= .16, p=.002\). However, men did not, \(b= .13, SE= .14, p=.34\). The effect of partner touch on subjective experience differed significantly by gender, \(χ²\text{diff}(1)=9.53, p=.002\). Next, compared to the control condition, when women were touched by an opposite-gender stranger, their affective state at post-test was lower that of women in the control condition, \(b= -.43, SE= .15, p=.005\). However, men's was not, \(b= -.12, SE= .14, p=.41\). The effect of stranger touch significantly differed by gender, \(χ²\text{diff}(1)= 7.61, p=.006\). Next, the APIM revealed that, the effect of partner touch on HR was not significant for women, \(b= -.37, SE= 2.56, p=.88\), nor for men, \(b= -1.81, SE= 1.35, p=.18\). and was similar for men and women, \(χ²\text{diff}(1)= .25, p=.31\). The pooled effect for both genders was \(b= -1.50, SE= 1.19, p=.21\). When an opposite-gender stranger touched women, their HR during the task was similar to that of women in the control group, \(b= 1.76, SE= 2.54, p=.49\). the same held for men's heart rate, \(b= -.23, SE= 1.28, p=.85\). The effect did not differ between men and women, \(χ²\text{diff}(1)= .49, p=.24\). Compared to the control condition, the effect of partner touch was not significant for either women, \(b= -.12, SE= .20, p=.55\), nor for men, \(b= -.11, SE= .17, p=.51\). Those effect did not differ by gender, \(χ²\text{diff}(1)= .002, p=.48\). However, when an opposite-gender stranger touched a woman, she had a significantly lower mean HRV during the task than women in the control group, \(b= -.45, SE= .20, p=.02\), while men's HRV did not differ from the control condition, \(b= -.07, SE= .16, p=.65\). The effect of stranger touch differed
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marginally by gender, $\chi^2_{diff(1)} = 2.28, p = .07$. Figure 1 depicts the results regarding the gender differences for the three outcomes.

Discussion

The present study investigated the subjective and physiological reaction to a personally relevant stressor when being touched. It combined the investigation of touch from different persons (romantic partner vs. an opposite-gender stranger) to the one of gender differences, while having a no-touch control condition. Moreover, we assess both the subjective and physiological reaction. To our knowledge, this is the first study doing so and hence allowing to better understand how similar effects of touch by a partner and a stranger are across genders.

Contrary to the extant literature, the results revealed that, when not distinguishing the source of the touch, the latter did not change the subjective (i.e. participants’ affective state), nor the physiological stress-reaction. Testing our second hypothesis revealed no significant difference between partner and stranger touch, neither for the subjective nor for the physiological reaction. However, the investigation of gender differences revealed first that, contrary to our hypothesis, there was a gender difference in the effect of partner touch, such that it seemed to buffer women’s subjective stress response but not men’s. A similar difference emerged regarding opposite-gender touch: women seemed to benefit more than men. Interestingly however, women showed an increased physiological stress reaction (as measured by heart rate variability) when touch by as stranger, while men did not. Finally, HRV was not affected by partner touch, and neither partner nor stranger touch affected heart rate frequency,
At the subjective level, only women experienced a significant buffering effect of partner touch. This gender difference differs from most of the previous literature. This might be due to the specific design of the present study. Indeed, participants were given a (false) failure feedback and men might have felt less comfortable in the presence of their partner than women (ADD REF). For opposite-gender touch also, only women experienced a significant buffering effect. This contradicts previous research showing that men perceive this touch more positively than women (Heslin et al., 1983; Kirsch et al., 2018; Struckman-Johnson & Struckman-Johnson, 1993). Again, this might be explained by the specific design of the present study.

At the physiological level, our results indicate that opposite-gender touch increases—rather than buffers—women’s stress reaction as measured by HRV. To our knowledge, this is the first study to show this specific feminine physiological reaction to opposite-gender touch. Some studies indicate that a stranger’s touch might indeed increase women’s stress reaction. First, Master et al. (2009) found that, while holding their partner’s hand decreased women’s subjective pain rating in reaction to a thermal stimulation, holding a male stranger’s hand increased it compared to their baseline. The increase was stronger than when women held an object, indicating that an opposite-gender stranger’s touch adds stress to an already stressful situation. However, no man participated in Master et al.’s study, so that assessing gender differences was not possible. Second, Coan et al. (2017), found that, while partner touch buffered neural activity in reaction to a threat, an opposite-gender stranger touch did not. However, they do not report gender differences. Based on our results, we can hypothesize that one effect canceled the other; while men might have benefited from opposite-gender stranger touch (or at least not be additionally...
stressed by it), women might have had a stronger neural stress reaction under this condition.

Importantly, there was a discrepancy in women’s subjective and physiological responses to the stressor in the stranger touch condition: while they reported decreased subjective distress, their HRV measure indicated an increased arousal. A possible explanation is that women are generally more exposed to opposite-gender sexual harassment, as has been shown in numerous studies (O'Leary-Kelly et al., 2009; Rotundo et al., 2001). They might thus be conditioned to be more vigilant and more reactive to opposite-gender touch. Indeed, previous research indicates that trauma-exposed persons are more reactive to induced negative emotions (McTeague et al., 2010). Moreover, in previous research, women have shown similar discrepancies; Kirschbaum et al. (1995) found that women reacted more negatively to the social support provided by their partner than men did, but that they evaluated this social support more favorably than men did.

We found no effect of partner nor stranger touch on the heart rate frequency. This is not congruent with previous studies that found a buffering effect of touch when measured with HR, when touch was provided by the partner (Grewen et al., 2003; Triscoli, Croy, Olausson, & Sailer, 2017) or by a stranger (Vrana & Rollock, 1998). Moreover, partner touch had no effect on HRV. To our knowledge, only one study has investigated the effect of touch on HRV and found that HRV gradually increased (indicating a reduction of stress) when touch was provided for a long time by a robotic device (35 min.; Triscoli, Croy, Steudte-Schmiedgen, et al., 2017). However, the authors did not induce stress in the participants, whereas we did.
Limitations and Future Directions

To our knowledge, this is the first randomized controlled study investigating touch from different persons (romantic partner vs. an opposite-gender stranger) while examining gender differences and assess the subjective and physiological reaction. Despite its strengths, some limitations deserve mentioning. First, given that not all ECG were valid, the sample size was not sufficient to detect small effects in the physiological reactions. Future research should replicate this study with a larger sample, therefore extra caution should be taken in interpreting null effects. Second, the chosen touch manipulation (a hand on the shoulder) was minimal, to allow it to be acceptable when provided by stranger. The touch that appears as affectively most beneficial is a stroking stimulation that activates the so-called C-tactile fibers (CTs), a particular class of unmyelinated, low threshold and slowly conducting mechanoreceptors (Löken et al., 2009). Indeed, CT-optimal touch (corresponding a typical caress) is evaluated as most pleasant and appears to have most benefits on HRV (Triscoli, Croy, Steudte-Schmiedgen, et al., 2017). Hence, results might be different with CT-optimal touch. Third, the present design does not allow distinguishing if gender differences were due to the gender of the touch giver or the touch receiver, or their combination as we had no same-gender touch pairings. Future research should investigate all possible combinations of gender, both with strangers and partners (Meuwly & Randall, 2019).

Conclusion

An increasing number of scholars are investigating interpersonal touch and most research reveals its benefits (see Jakubiak & Feeney, 2017). The present study’s design allowed differentiating the stress-buffering effects of touch as a function of acquaintance
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with the toucher and gender of the target. Results indicate that, when investigating the effects of touch as a stress-buffer, it is important to consider gender differences, especially when investigating touch in unacquainted relationships. This contributes to nuance the benefits of touch.
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Table 1.

*Participants’ Means and Standard Deviation at Baseline and Post-Test*

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-test</th>
<th>t</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective distress</td>
<td>1.98 .53</td>
<td>2.27 .70</td>
<td>-6.35</td>
<td>221</td>
<td>&lt;.001</td>
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<tr>
<td>HR (mean)</td>
<td>74.11 10.44</td>
<td>75.05 11.62</td>
<td>-1.57</td>
<td>143</td>
<td>.12</td>
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<tr>
<td>HF-HRV</td>
<td>6.44 .86</td>
<td>5.91 .83</td>
<td>5.05</td>
<td>143</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Note: HR = Heart Rate Frequency; Hf-HRV = High-Frequency Heart Rate Variability*