SOME TOUCHING SITUATIONS: THE RELATIONSHIP BETWEEN GENDER AND CONTEXTUAL VARIABLES IN CARDIOVASCULAR RESPONSES TO HUMAN TOUCH[1]

Wendy J. Nilsen and Scott R. Vrana, Ph.D.
Purdue University

ABSTRACT

This study examined how cardiovascular reactivity to human touch is affected by the social context of the situation. Context for a ten-second touch was manipulated for 61 male and 64 female undergraduate participants in three ways: professional touch, where participants were touched on the wrist to have their pulse taken; social touch, an unexplained touch to the same area of the arm; and a no-touch control, where participants were told their pulse was being taken automatically without being touched. Social context was also manipulated by employing both same-sex and opposite-sex touch experimenters. In the professional touch and no-touch conditions, participants' heart rate and blood pressure decreased overall; however, in the social touch condition initial increases were observed for both measures. Female experimenters produced greater heart rate decreases than male experimenters. The greatest cardiovascular increases were found with women being touched by men in the social condition. These data suggest that both context and gender are important contextual factors in determining cardiovascular reactivity.

(**Ann Behav Med** 1998, *20*(4):270–276)

INTRODUCTION

Studies of cardiovascular reactivity have typically relied on non-social stressors such as mental arithmetic, cold pressor, or video game challenge to elicit reactivity. However, these non-social stimuli may be less relevant to models of cardiovascular risk factors than are social stressors (e.g. 1–3), nor do they necessarily predict response to social stressors (4). Furthermore, response to non-social stressors may be affected considerably by the social context of the situation (5). Thus, researchers have begun to assess reactivity to social variables and have found that cardiovascular reactivity is affected significantly by subtle changes in the context of the experiment, such as the ethnicity of the experimenter (6), mere observation (7), and attempts to influence the experimenter (5). Given the effect of these subtle manipulations, it seems clear that touch, one of the most significant and powerful forms of non-verbal social communication (8), would have a considerable effect on cardiovascular reactivity. Since touch is nearly unavoidable in any research or practical application involving psychophysiological measurement, it is important to examine the effect of touch and the social context in which it occurs.

In most of the major theories of non-verbal behavior (e.g. 9–11), contextual variables such as the location of the touch, the roles and gender of the parties involved, and the setting in which the touch occurs are posited as playing a central role in determining responses. In Patterson's sequential functional model of non-verbal behavior (10), the major determinants of interactions are antecedent determinants, including personal factors such as gender and cultural differences; experiential factors, such as an individual's learning history with non-verbal behavior or situations; and situational–relational factors, more commonly known as contextual variables. Thus Patterson's model predicts that both context and gender are important factors in determining an individual's response to touch.

Currently, little research has been conducted overtly exploring reactions to touch in different relationships or settings. In two investigations in which context was varied either by touching participants with and without justification (12) or by manipulating high and low experimenter valence (11), the contextual manipulations did influence both the behavior of the person who was touched and their impressions of the person who had touched them. To date, no physiological investigations have overtly explored the effect of context on human responses to touch, but the effects of context can be inferred from the research that has been conducted. Context can be identified by the effects of differing methodologies on responses to touch. For example, investigations (e.g. 13–15) that fully inform participants of the nature and timing of the touch in advance (i.e. participants are told they will be touched, for how long, and for how many times) have found consistent decreases in heart rate. Touch that occurred in the context of pulse-taking in an experiment not identified as a touch "investigation" also produced decreases in heart rate, but only when the ethnicity of the participant and experimenter were matched (16). In investigating touch in a hospital cardiac care unit (17), variable results were found: one participant showed a decrease (of as much as 30 beats per minute), while two others evidenced increases. Moreover, participants who were touched while completing complex cognitive tasks showed a greater increase in heart rate as compared to participants in a no-touch condition (18). Drescher, Gantt, and Whitehead (13) found that heart rate responses were different depending on whether a participant touched themselves or was touched by an experimenter. Finally, mutual touch (hand-holding) by unacquainted opposite-sex pairs also produced a significant increase in heart rate (19). The differing contexts in these investigations may be producing the diverse responses to human touch.

Compared to contextual variables, gender differences in touch have been more thoroughly investigated. A majority of available research has found evidence of gender differences in touching behavior and attitudes toward touch. Most research (e.g. 20,21) indicates that women are more often the recipients of touch than men. Although men and women touch the opposite sex equally often (20–22), women are more frequently the recipients of same-sex touch than men (20) and report less discomfort with same-sex touch than men (23–27). In fact, men are unlikely to

[1] Preparation of this manuscript was supported in part by National Institute of Child Health and Human Development grant HD30581.

Reprint Address: W. J. Nilsen, Department of Psychological Sciences, Purdue University, West Lafayette, IN 47907-1364.

touch other males in any way other than a handshake (20,21,28). Same-sex female touch is seen as more normal and less sexual than any contact between males, although same-sex touch in general is seen as less normal than opposite-sex tactile behaviors (29). Observational studies have consistently shown that same-sex touch is considerably less frequent than opposite-sex touch in adults (20–22,28,30,31).

Researchers have begun to include cardiovascular reactivity as a way of exploring gender differences, although findings on sex differences in physiological reactions to touch are inconclusive. Whitcher and Fisher (32) found that women touched preoperatively by a female nurse showed lower postoperative diastolic and systolic blood pressure, as well as reduced scores on measures of anxiety, than untouched females, while men exhibited more anxiety and higher blood pressure after being touched by the same female nurses. Hosey, Jones, and Meador (15) found no gender differences between men and women when heart rate and respiratory responses to touch were monitored. In addition, Drescher and associates (13,14) found no significant differences in cardiovascular measures between men and women while employing both male and female experimenters for same-sex and opposite-sex touch. However, Vrana and Rollock (16) found that men exhibited less heart rate reduction than women in response to same-sex touch, although this effect was complicated by an interaction between the subject's and experimenter's racial background.

Contrary to the predictions of Patterson's model (10) and despite the diversity of the results highlighted thus far, many physiological researchers (e.g. 13–15) have dismissed the importance of gender and context in response to touch, instead calling the response reflexive. This is because the majority of researchers examining human cardiac reactivity to tactile stimulation have found a reliable decrease in heart rate which did not habituate over trials (13–15). Furthermore, the response found in humans is comparable to heart rate decreases seen in monkeys and other animals (e.g. 33). This decrease in heart rate in humans is so consistent and reliable that Drescher and associates have suggested that the reduction "represents a potent primitive mechanism for establishing an emotional attachment between mother and infant which persists into adulthood" (14, p. 99). Others have been less bold and labeled the decrease as an orienting response (15).

However, all of the investigations that found heart rate decreases (i.e. 13–16) have used a fully informed touch; that is, participants expected a professional (i.e. the experimenter) to touch them for a specific reason. Thus, all of the investigations in which this consistent decrease was found shared a common and highly salient context in which the function of the touch was clearly understood. The importance of the function of the touch may be crucial to explaining the discrepancies outlined here. In Patterson's sequential functional model (10), the antecedent, experiential and situational–relational or contextual factors interact before the actual non-verbal exchange to determine the function of the interaction (10). This function can range from "facilitating service or task goals" (professional) to "expressing intimacy" (10). Depending on the perceived function of the touch, an individual can exhibit a wide variety of physiological, cognitive, or behavioral responses, ranging from remaining neutral pending further information to becoming aroused, either in a positive or negative manner. Thus, in experiments in which fully-informed methodologies were employed (i.e. 13–16), the touch may have had a perceived professional function, resulting in relaxed, compliant behavior that prompted the observed heart rate decreases. Experiments finding mixed results or heart rate increases (i.e. 17–19) used procedures that left the perceived function of the touch more ambiguous. Possibly in these studies touch was perceived as having a more intimate or social function, resulting in physiological arousal.

THE CURRENT EXPERIMENT

In order to more systematically investigate the physiological effect of context and gender on touch, heart rate and blood pressure were measured as participants were exposed to two forms of touch: the touch–pulse (where the participant was touched on the wrist to have their pulse taken) and social touch (an unexplained touch to the same area of the arm). The touch–pulse segment was included as a professional touch manipulation, replicating the past fully-informed methodologies, and thus should have an unambiguous function and not be subject to the arousal changes that other forms of touch with more intimate functions might engender. The social touch segment was included as an ambiguous touch situation. It was hypothesized that the social touch would not have a clear-cut function and therefore would show more evidence of arousal than the professional touch segment. In addition, to observe the effects of gender, the sex of the participant and the experimenter was fully crossed in each of the experimental contexts. It was expected that the social touch, with a more ambiguous function, would be more susceptible to gender effects. A third condition was also included in which participants were informed that their pulse was being taken automatically (non-touch pulse). The non-touch pulse segment is included to examine an individual's autonomic reactions to a professional touch situation or having their pulse taken in the absence of touch. It was unknown if the decrease in heart rate found during past informed touches (i.e. 13–16) was caused by a general lessening of somatic activity (34) dictated by the nature of the situation (i.e. a "sit still" script is activated) or actually a decrease in response to touch. This manipulation is included to examine cardiovascular changes in response to a professional touch context, but in the absence of touch.

METHOD

Participants

One hundred and twenty-five White, native-born American participants (64 women and 61 men, mean age = 19.46, SD = 1.75) were recruited from introductory psychology courses. All participants received class credit for completing the investigation. Thirteen additional participants who identified themselves as belonging to an ethnic group other than Caucasian or indicated that they were born outside of the United States were excluded because earlier research has indicated that there are cultural and ethnic differences in tactile behavior (35,36).

Apparatus

Participants were tested individually in a 10.5 ft × 7.5 ft room adjacent to the equipment room. Timing of events and data collection were handled by an AT-compatible computer controlled by software designed for human psychophysiological investigations (37). Heart rate was obtained with a Coulbourn Optical Pulse Monitor clipped to the first finger of the participant's left hand. This monitor's signal triggered a digital input on the computer, which recorded the interbeat interval in milliseconds. In addition, blood pressure was measured on every heart beat using an Ohmeda

2300 Non-Invasive Blood Pressure Monitor with a specialized cuff attached to the middle finger of the left hand.[2]

Procedure

Participants were recruited for a "questionnaire completion and physiological monitoring" study. To insure that the touch occurred unexpectedly, participants were only informed that their physiological responses would be collected while they completed a questionnaire, and the entire touch manipulation was conducted during a period when the participant was presumably waiting for the investigation to begin. At the end of the experimental session, participants were fully debriefed on the nature and objectives of the study.

Participants were met by a female research assistant at the laboratory who seated them in a comfortable chair and attached and explained the monitoring equipment. Interaction between the research assistants or touch experimenters and the participant was extremely limited, following a rehearsed script. This procedure was instituted to minimize differences between laboratory personnel and to standardize both the verbal and non-verbal communication with the participants.

Once the sensors were attached, the research assistant left the participant alone in the room for two minutes. Participants were told that an experimenter would be with them shortly and were asked to relax and remain quiet during this waiting period. This two-minute solitary period allowed for the collection of the initial baseline measures.

At the end of the two-minute period, the touch experimenter (henceforth called the experimenter) entered the room. Because of the extensive tactile stimulation involved in attaching the monitoring equipment, the experimenter was someone other than the original research assistant. The experimenter was either the same sex or the opposite sex as the participant, and approximately equal numbers of male and female participants were paired with a same-sex or opposite-sex experimenter. Three female and two male experimenters were employed for this investigation. The experimenter introduced himself or herself as a graduate student affiliated with the laboratory. After introducing themselves, the experimenter sat next to the participant and quietly completed forms for thirty seconds.

After the thirty seconds had elapsed, the first touch segment began. All participants were exposed to each of the three different conditions: non-touch pulse, touch pulse, and social touch. Because of the possibility of sequence effects, all six possible orders of the three touches were employed, and approximately an equal number of participants was assigned to each order. For all touch segments, the experimenter made eye contact with the participant and then said one sentence before touching the participant. In the non-touch pulse condition, participants were told, "To check the equipment, I need to take your pulse. The cuff on your finger will take it automatically. Let's begin." The experimenter then looked at his or her watch for ten seconds. In this segment, participants were not touched. In the pulse segment, the experimenter took the participant's pulse in the conventional manner by holding his or her wrist. After making eye contact, the experimenter said, "To check the equipment, I need to take your pulse. Let's begin." The experimenter then touched the participant's wrist for ten seconds while looking at a watch as if monitoring a pulse. The final touch segment was the social segment. Here, the experimenter looked at the participant and said, "I'm sorry for the delay, just hang in there a little longer." While looking at papers in his or her lap, the experimenter then touched the participant's wrist for ten seconds. In all of the conditions, when ten seconds had elapsed the experimenter again looked at the participant, smiled, and said "good," and under the premise of checking the monitoring equipment in the next room, excused themselves for a two-minute period.

After the two-minute period, the experimenter again entered the room and the next ten-second touch segment began. This pattern of a thirty-second experimenter in the room baseline followed by a ten-second touch and then a two-minute baseline continued until all three touch segments had been completed. When all three segments were complete, participants were told that the study was ready to begin and given a questionnaire to complete, presumably while their cardiovascular responses were measured (physiology was not actually collected during this period). The participants were then left alone in the room to fill in the forms and were thoroughly debriefed upon their completion.

DATA REDUCTION AND ANALYSIS

Cardiac interbeat intervals were converted off-line to beats per minute, and systolic, diastolic, and mean arterial blood pressures[3] were calculated in mm/Hg. Data for each ten-second touch period were examined second by second. All data points were converted to change scores by subtracting the mean of a ten-second resting baseline from each second in the touch period. The resting baseline employed for each touch segment was defined as the mean of the final ten seconds of data collected when a participant was in the room alone prior to the experimenter entering for that touch segment. Heart rate and blood pressure were subjected to an analysis of variance (ANOVA) with Sex of the participant (male, female) and Sex of the experimenter (male, female) as between-subject variables. Within-subject variables were the Kind of touch (non-touch, pulse, or social) and Time (ten one-second change scores for each touch segment). Because of the sphericity associated with repeated measures, a Greenhouse–Geisser correction was employed for all analyses, and corrected probability and epsilon values are reported where appropriate.

RESULTS

Heart Rate

As expected, heart rate differed as a function of the kind of touch [$F(2, 210) = 7.33, p < .001, \epsilon = .9911$]: the pulse condition showed a greater decrease (mean = -3.72 beats per minute [BPM]) than either the non-touch [mean = -1.66 BPM; $F(1,105) = 9.02$, $p < .005$] or social conditions [mean = -1.11 BPM; $F(1,105) = 12.96$, $p < .001$], while the latter two did not differ significantly [$F(1,105) = .54$, $p > .45$]. In addition, mean heart rate change over the ten-second touch period for the pulse and non-touch conditions was significantly lower than baseline

[2] Skin conductance was also measured for all participants. Analyses revealed that electrodermal activity in the two pulse conditions responded to the instructions, prior to the touch, that the participant's pulse was to be taken. This anticipation of the touch in these two conditions makes it difficult to disentangle the effect of the different contexts and therefore is not presented here. Analyses of skin conductance can be obtained from the authors.

[3] Data for diastolic, systolic, and mean arterial blood pressure were collected. Similar results were obtained for all three measures; so, for simplicity, only mean arterial blood pressure is reported.

[pulse – t(134) = −5.73, $p < .0001$; non-touch – t(120) = −3.29, $p < .005$], while social touch was not [t(119) = −1.65, $p > .10$].

In addition to a main effect for the kind of touch, Figure 1 illustrates a significant interaction between the kind of touch and time [F(18,1890) = 4.66, $p < .0001$, $\epsilon = .4607$], as well as a main effect for time [F(9,945) = 14.70, $p < .0001$, $\epsilon = .4506$]. In order to explore the relationship between the kinds of touch and their changes over time, additional one-way ANOVAs were conducted to examine the effect of the kind of touch at each of the ten seconds. To simplify reporting of these results, these analyses were collapsed into three-second intervals (i.e. first three, second three, and third three seconds of the touch period, with the tenth second omitted for simplicity). These results indicate that there were significant differences between the kinds of touch for only the first two-thirds of the touch period [sec 1, 2, 3 – F(2,218) = 12.11, $p < .0001$, $\epsilon = .9786$; sec 4, 5, 6 – F(2,216) = 6.46, $p < .005$, $\epsilon = .9438$]. In the first three seconds of the period, heart rate changes in the social touch segment were significantly greater (+1.27 BPM) than the non-touch condition [−1.01 BPM, F(1,109) = 6.31, $p < .05$], which, in turn, was significantly greater than the pulse touch segment [−3.12 BPM, F(1,109) = 6.51, $p < .05$]. In seconds four, five, and six of the segment, the changes in the social and non-touch conditions were not significantly different [social mean = −1.72 BPM, non-touch mean = −2.27 BPM; F(1,108) = .40, $p > .50$], while both conditions exhibited significantly smaller decreases than the pulse condition [pulse mean = −4.41 BPM; social/pulse – F(1,108) = 11.48, $p < .001$; pulse/non-touch – F(1,108) = 9.33, $p < .005$].

Overall, female experimenters produced a significantly greater heart rate deceleration than did male experimenters [female mean = −2.99, male mean = −1.34, F(1,105) = 4.26, $p < .05$]. In Figure 2, it is apparent that female experimenters produced greater mean decreases and that these decreases have a completely different pattern and time course for each kind of touch [Experimenter × Kind of touch × Time; F(18,1890) = 2.21, $p < .05$, $\epsilon = .4607$]. Separate analyses of each touch condition revealed a significant experimenter by time interaction in the social condition [F(9,999) = 2.87, $p < .05$, $\epsilon = .4523$], but not in the pulse [F(9,1008) = 1.09, $p > .36$, $\epsilon = .5954$] or non-touch conditions [F(9,1026) = .22, $p > .85$, $\epsilon = .2848$]. Further analyses of the social touch condition alone revealed that differences due to the experimenter were found only in the last five seconds of the period. During these last five seconds, female experimenters produced significantly greater heart rate deceleration than did male experimenters [male mean = −0.85, female mean = −3.37, F(1,112) = 5.91, $p < .05$].

In addition, as illustrated in Figure 3, there was an interaction of both participant and experimenter sex with the three kinds of touch [F(2,210) = 4.70, $p < .05$, $\epsilon = .9911$]. Further analyses revealed that with a female experimenter the participant Sex by Kind of touch interaction was not significant (see the left half of Figure 3); [F(2,114) = 0.62, $p > .50$, $\epsilon = .9525$]. However, with male experimenters a reliable interaction between the sex of the participant and the kind of touch was found (see the right half of Figure 3) [F(2,120) = 5.76, $p < .01$, $\epsilon = .9316$], such that male participants showed no effect for the kind of touch [F(2,52) = .14, $p > .85$, $\epsilon = .8958$], while the context significantly affected female participants [F(2,50) = 8.30, $p < .001$, $\epsilon = .9388$]. For female participants with a male experimenter, the social touch condition produced significantly greater heart rate change (mean = +1.38 BPM) than the pulse condition (pulse mean = −4.56 BPM) [F(1,25) = 17.95, $p < .0005$]. In addition, the decreases in the pulse condition were also significantly greater than the decreases in the non-touch condition (non-touch mean = −0.49 BPM) [F(1,25) = 8.63, $p < .001$]. Finally, the

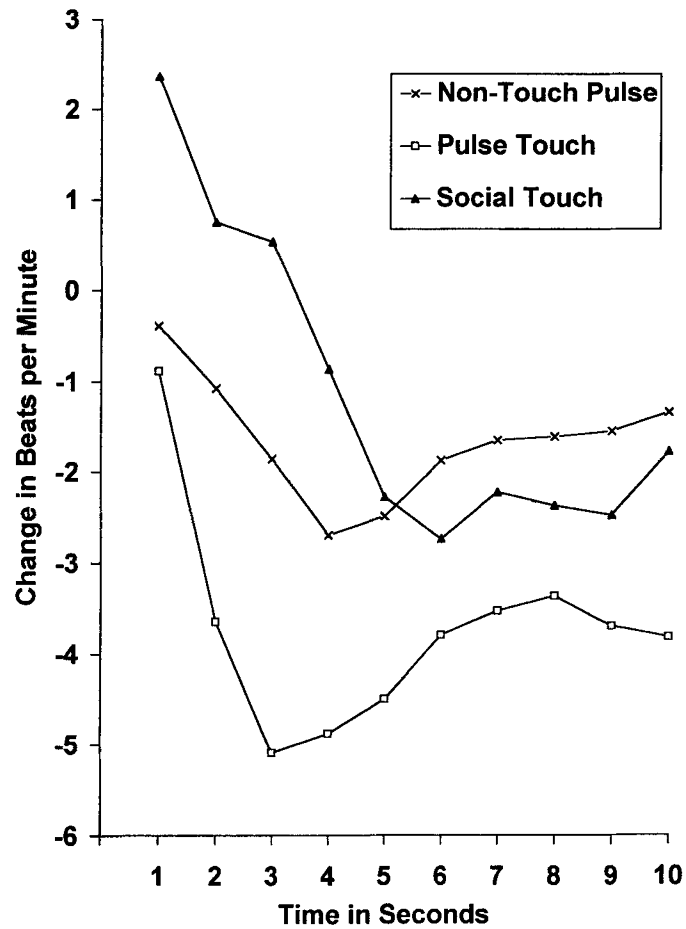

FIGURE 1: The change in heart rate over time in response to three different kinds of touch.

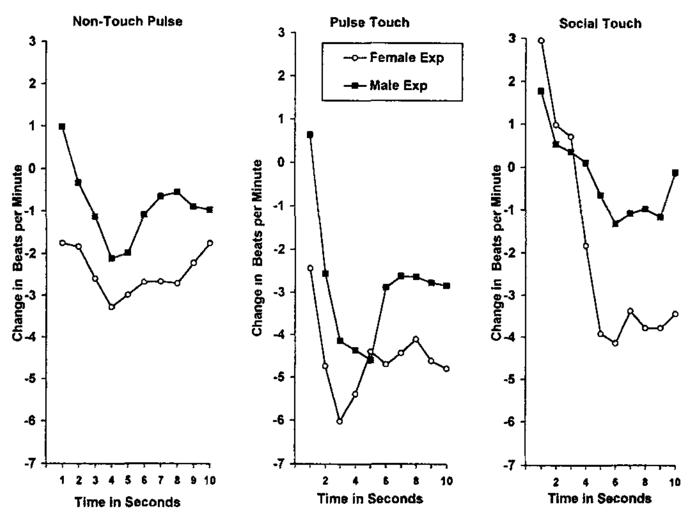

FIGURE 2: The change in heart rate over time, examined individually by the kind of touch and the sex of the experimenter (non-touch—left; pulse touch—center; social touch—right).

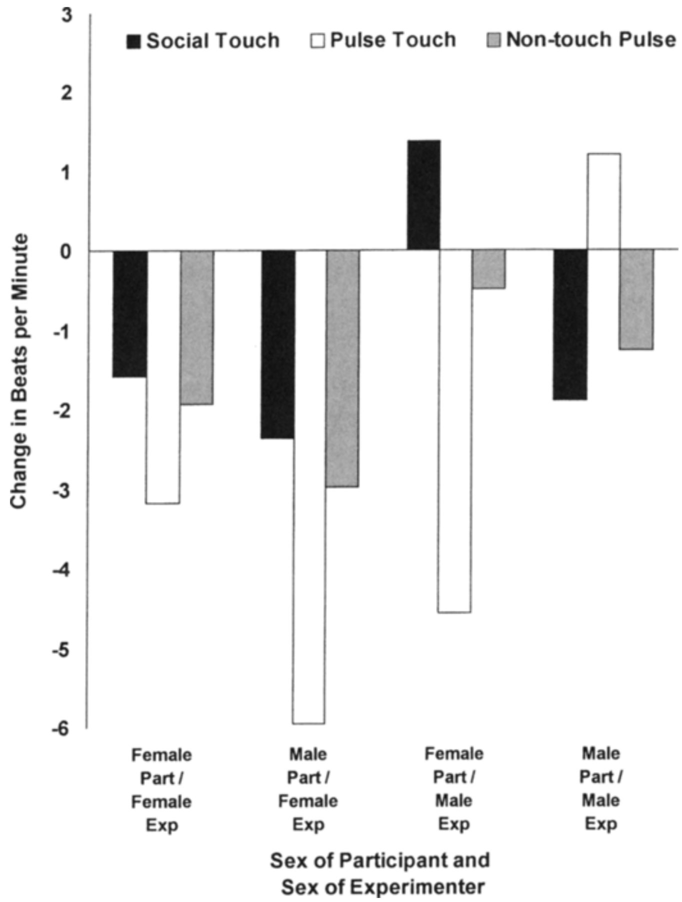

FIGURE 3: Changes in heart rate in each of the three touch conditions based on both the sex of the participant and the sex of the experimenter.

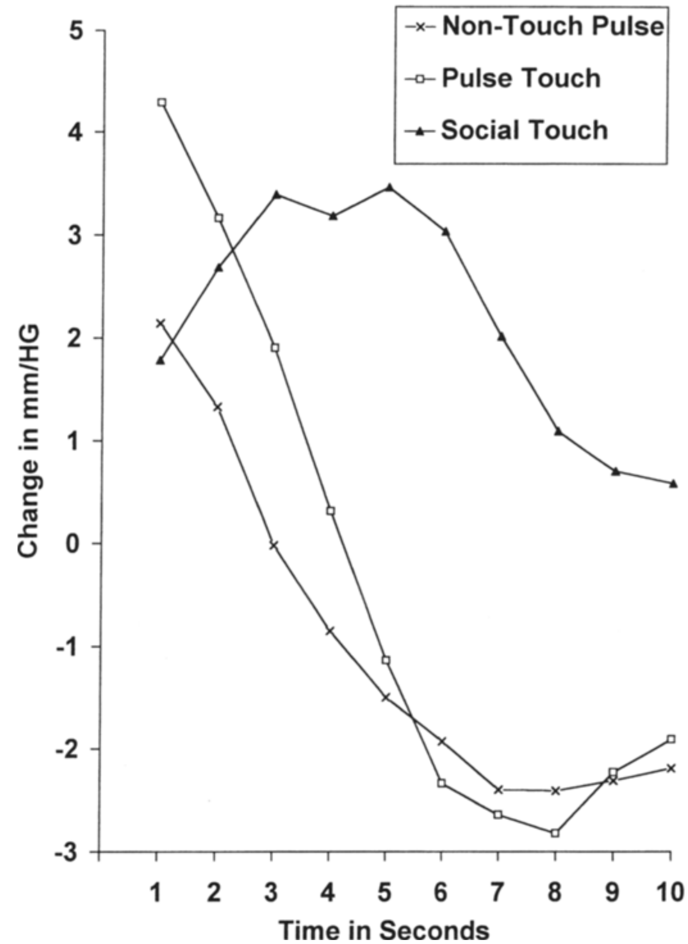

FIGURE 4: Changes in the mean arterial blood pressure over the ten-second touch period based on the kind of touch.

non-touch and social conditions did not differ significantly from each other [F(1,25) = 1.25, $p > .25$].

Mean Arterial Blood Pressure

As found with heart rate, there was a significant main effect for the kind of touch [F(2,160) = 7.37, $p < .0005$, $\epsilon = .9553$], with social touch showing a mean increase (+2.19 mm/Hg) for the period and pulse (−.34 mm/Hg) and non-touch (−1.01 mm/Hg) exhibiting an overall decrease. Further analyses revealed that mean changes in the social touch condition were significantly greater than both the pulse [F(1,80) = 10.59, $p < .0005$] and the non-touch segment [F(1,80) = 12.02, $p < .001$], while the latter two did not significantly differ. In addition, mean changes in mean arterial pressure over the ten-second period were significantly greater than zero in the social condition [t(95) = +3.63, $p < .001$] and were not significantly different from zero in the other two conditions.

As can be seen in Figure 4, in addition to the main effect for the kind of touch, there was an interaction between the kind of touch and time [F(18,1440) = 9.64, $p < .0001$, $\epsilon = .2307$] and a main effect for time [F(9,720) = 35.60, $p < .0001$, $\epsilon = .2233$]. This Time by Kind of touch interaction was explored by analyzing the three kinds of touch at each second, which for reporting purposes was collapsed into three-second intervals (i.e. first three, second three, and third three seconds of the touch period, with the tenth second omitted for simplicity). There was a significant effect of the kind of touch in seconds four through nine [seconds 1, 2, 3—F(2,160) = 2.19, $p > .10$, $\epsilon = .9968$; seconds 4, 5, 6—F(2,160) = 13.97, $p < .0001$, $\epsilon = .9693$; seconds 7, 8, 9—F(2,160) = 8.58, $p < .001$, $\epsilon = .9284$]: increases in the social touch segment were significantly greater than both the non-touch (seconds 4, 5, 6—F(1,80) = 22.19, $p < .0001$; seconds 7, 8, 9—F(1,80) = 9.80, $p < .005$) and the pulse condition (seconds 4, 5, 6—F(1,80) = 22.88, $p < .0001$; seconds 7, 8, 9—F(1,80) = 17.73, $p < .0001$), while the latter two did not significantly differ (seconds 4, 5, 6—F(1,80) = 0.13, $p > .75$; seconds 7, 8, 9—F(1,80) = 0.03, $p > .85$].

There was also a significant Participant sex × Experimenter sex × Time interaction [F(9, 720) = 3.38, $p < .05$, $\epsilon = .2233$]. The pattern of the data showed steeper declines over the ten-second period (e.g. higher starting blood pressure and lower ending blood pressure) for opposite-sex pairs (i.e. female participants with male experimenters and male participants with female experimenters). However, analyses of the Participant by Experimenter sex interaction at each second failed to statistically support this pattern.

DISCUSSION

The results indicate that social context directly affected cardiovascular responses. For both heart rate and blood pressure, the changes found in the social touch condition were greater than in the pulse segment even though the touch occurred on the same part of the body and for the same length of time in each condition. For heart rate, this involved significant decelerations below baseline during the pulse touch without comparable decreases during the social touch. For blood pressure, increases significantly above baseline were only found during the social touch. For heart rate, the differences between conditions were strongest in the first six seconds of the touch period, whereas for blood pressure, the differences were greater in the latter two-thirds of the period. These differences in time course and direction may be due to cardiovascular compensatory mechanisms controlling the two measures (34).

Gender of the experimenters also affected the cardiovascular response. Female experimenters produced greater heart rate decelerations than male experimenters regardless of context. However, this difference between male and female experimenters was greatest during the latter half of the social touch condition when compared to the pulse or non-touch segments. Finally, women reacted most strongly to being touched by a male experimenter in the social touch condition. Indeed, only when a male experimenter touched a female participant in the social condition did heart rate increase and remain above baseline in response to the touch.

Interpersonal context was a key feature in determining cardiovascular responses. Patterson (10) suggests that context affects responses because it is a determining factor in the respondent's understanding of the non-verbal behavior. Thus, when the function of the touch was clear and professional, as it was in the pulse condition, participants exhibited a decrease in both heart rate and blood pressure. Patterson (10) suggests that common professional situations evoke certain scripts that govern both overt and covert behavior. Thus, in the pulse condition where participants were told their pulse was being taken, a script was activated requiring them to behave in a manner conducive to having their pulse taken; that is, sitting very quietly. This reduction in somatic activity should produce a decrease in heart rate and blood pressure (34). Indeed, in this study the pulse condition produced a decrease in heart rate (−3.72 BPM) that is comparable to decreases found by past researchers using other fully informed methodologies (e.g. −5 BPM, 13; −3 BPM, 14; −3.54 BPM, 15; −3 BPM, 16). In the social touch, the function was ambiguous and may have been perceived as conveying intimacy or social control (10), both of which would have been inappropriate in a laboratory experiment. Other researchers who did not ascribe a function or ascribed a non-professional function to the touch (e.g. 18,19) also found increased heart rate in response to touch. As Heslin and Alper (38) have noted, "touching can convey liking, power and sexuality. All three of these aspects of relating to another person can be somewhat frightening and disturbing" (p. 50). Thus, the autonomic arousal evidenced by some participants in the social condition may have been caused by the unspecified and possibly inappropriate function of the touch in that context.

In addition, the lack of sex effects in the pulse condition found in this investigation is consistent with the findings of past fully-informed methodologies (13–15). The results suggest that when the function of the touch is professional, the sex of both participants loses its significance. When the function of the touch is less clear (e.g. in the social touch condition), the sex of the person doing the touching becomes important in determining the response. Men and women perceive and interpret touch differently (12,39–41) and develop their perceptions of touch based on the gender of the person who is touching (12,25,29). Heslin and Alper (38) have noted that women and men include information about the sex of the person touching as a cue to what to expect from another's touch. Other researchers (e.g. 23,24,36,42) have shown that women indicate more comfort with same-sex touch than men, but more discomfort with opposite-sex touch than males. Thus, when a woman is touched for a specified reason, such as having her pulse taken, heart rate decreases are found regardless of the sex of the person touching. But when the same woman is touched by a man and the function of the touch is ambiguous (i.e. the social touch condition), heart rate increases, perhaps because women often perceive the touch of males to have a sexual or intimate function (29,40). In addition, because being the recipient of touch from a woman is perceived as more appropriate for either sex than touch from a male (20,29), it is not surprising to find that women touching produced greater heart rate decreases overall than males touching. The autonomic responses to the different contexts found in this investigation are therefore consistent with the findings concerning gender in past behavioral and self-report research.

The idea that the heart rate response to touch is a "primitive" reflex (14) is not borne out by the results, although the specific effects of human touch are still in question. Hosey and associates (15) have suggested that the heart rate decreases found in responses to human touch are an orienting response. However, this explanation is problematic considering that the decreases in the pulse condition were greater than those found in the social touch condition. Orienting involves increased sensitivity to a stimulus either because it is novel or there is information to be gained from it. Once the information is extracted from the stimulus, there is no further need to orient to it (43). Therefore an orienting explanation would predict that the social touch—given its novel quality—would produce a larger orienting response than the pulse-taking touch, which provides little new information. Patterson's (10) hypothesis that there is a script activated during pulse-taking that requires participants to sit quietly while their pulse is being taken would explain the heart rate decreases found in both the pulse and non-touch, pulse-taking conditions. However, this cannot explain the larger decrease found in the touch-pulse compared to the non-touch pulse condition. Perhaps the touch acts as a cue to facilitate activating the pulse-taking script or as a measure of social control to insure that the script is being followed. This hypothesis could be examined by assessing heart rate and somatic activity during touch.

These results have important implications for research on cardiovascular reactivity and social psychophysiology. Most physiological research necessarily involves the experimenter touching the participant. Although this touch generally has a clear professional function, participants often make inferences about the meaning of an experiment and the experimenter's intent based on very subtle and unintended cues (44). Furthermore, these effects may be influenced by other uncontrolled aspects of the experiment, such as the specific combination of the gender and ethnicity of the participant and the experimenter (16). Thus, researchers interested in accounting for variability in cardiovascular response need to understand and attend to the effects of social context in order to explain variability that is often mistakenly attributed to individual differences (5) or nuisance variance. Unfortunately, this is not an easy task, since it is not always practical to balance the gender (and ethnicity) of experimenters and participants and examine the variance statistically. The current data suggests, for example, that consistent use of a male as opposed to a female experimenter would both overestimate reactivity and change the pattern of gender effects. Even this generalization, however, would depend on the nature of the tasks in which the experimenter and participant engage. At the very least, it is important in all studies of cardiovascular reactivity to report on the characteristics of both the participants and the experimenters.

Finally, an unresolved issue is whether the effects found here last long enough to influence responding on subsequent experimental tasks or, in the natural environment, to have any long-term effects on cardiovascular risk. At least within the experimental setting this may depend on initial reactivity and the nature of the subsequent tasks (45).

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