



Touch for Social Engagement and Therapy: A Narrative Review

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ABSTRACT

This narrative review includes summaries of research on touch for social engagement and for therapy. Touch for social engagement includes greeting touch, affectionate touch and buffers for touch deprivation. Typical greeting behaviors including shaking hands and hugging were superseded by fist and elbow bumping following safety concerns during COVID-19 lockdowns. Affectionate touch as in handholding, cuddling, caressing and kissing have received less recent research attention likely because of the difficulty recruiting participants for affectionate touch during COVID. Instead, touch deprivation has been common including data suggesting that 60% reported being touch deprived during COVID lockdowns, only 21 % of children were being touched a lot and only 38% of partners were being touched a lot. This level of touch deprivation may have preceded COVID based on an airport gate study showing that people were only touching 4% of their waiting time as they were spending most of their time on cell phones scrolling and texting. Although natural activities have been noted to compensate for touch deprivation such as exercise, several studies have attempted to simulate social touch in robots. Touch as therapy has included several different types of touch including cuddling and handholding during painful procedures and massage therapy for innumerable medical and psychiatric conditions. The underlying mechanism for the positive effects of touch involves the stimulation of pressure receptors, as in moving the skin, resulting in a slowing of the nervous system including decreased heart rate, increased heart rate variability, less stress hormone (cortisol), and the increased production of healthy neurotransmitters and natural killer cells to ward off bacterial, viral and cancer cells.

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The recent literature on touch can be divided into two general categories including touch for social engagement and touch for therapy. This review of the literature involved entering the terms touch and the last five years in the PubMed and PsycINFO search engines. This search yielded approximately 182 papers that were distributed across the categories of touch as social engagement and touch as therapy. Following the exclusionary criteria of single subject studies, pilot studies and foreign language studies and to represent these two touch categories, 39 papers were selected. For the purposes of this narrative review, the social engagement literature has been divided into sections on greeting touch, affectionate touch and touch deprivation. The touch as therapy literature has been divided into cuddling, caressing and handholding to reduce stress during medical procedures and massage therapy for treatment of different conditions. This is not an exhaustive but a representative selection from the current literature that was intended to be an update from an earlier narrative review of the literature on touch (Field, 2019).

Touch for Social Engagement

The types of touch for social engagement that are presented include greeting and affectionate behavior from the least to the most intimate. For greeting behavior, this ranges from shaking hands to high-fives, fist and elbow bumping and hugging. The section on affectionate touch also progresses from the least to the most intimate touching including hand-holding to holding, caressing and kissing. The section on touch deprivation moves from deprivation during COVID-19 to buffers for touch deprivation including exercise and touch from robots.

Greeting Touch

Shaking Hands

Shaking hands has its origins in ancient history as far back as our ancestral primates (Massie et al, 2022). It is popularly noted that shaking hands typically involves the right hand. This is

said to have originated as a peace gesture that would make it obvious to one's opponent that there was no weapon in the right hand – the right hand being the dominant hand for 92% of the population. Interestingly, the Boy Scouts shifted to shaking with the left hand because it was closer to the heart.

Some have examined the properties of an effective handshake (Nagy et al, 2019). A handshake of less than three seconds is considered normal while one of greater than three seconds is considered abnormal. In this study, less anxiety as measured by touching the face, occurred during the normal handshake. These results are not surprising inasmuch as a lengthy handshake would seem to be too intimate, and intimate partners are more likely to hug, even during COVID.

Grip strength has also been studied in terms of women's preferences for a man's handshake (Skirbekk et al, 2018). In this study from Norway, women were said to prefer a man's firm handshake. A firm handshake was related to health for women but not for men. The preference for the greater grip is not surprising since that would be stimulating pressure receptors that would lead to a slowing of the nervous system and lower stress levels, much like the effects of massage therapy (Field, 2021). In another research lab, the handshake was studied in the context of cooperative behavior. The title of this paper was "Handshaking promotes deal-making by signaling cooperative intent" (Schroeder et al, 2019). In this study, five protocols were conducted to document more cooperative behavior following handshakes including the use of games and negotiations that were antagonistic.

Fist bump/Elbow bump

Researchers have assessed the transfer of bacteria from the handshake as compared to other greeting behaviors. In a few studies that compared the handshake with a fist bump, the fist bump was noted to transfer lower levels of pathogens (Ghareeb et al, 2013; Pinto-Herrera

et al, 2020). In a third study, both high-fives and the fist bump transferred less bacteria than the handshake (Mela et al, 2014). In still another study, the elbow bump was noted to transfer less bacteria than the fist bump (15% for the elbow bump versus 25% for the fist bump) (Ahlmidi et al, 2021). Elbow bumping might be more pleasurable than hugging because it is typically accompanied by more face-to-face behaviors including smiling.

It is not clear that even as COVID continues, whether the more cautious, less contagious fist and elbow bumps will continue. High fives and fist bumps between team players have continued to appear on sports events. And, they are anecdotally used more frequently by men than women who tend to use the more gentle elbow bump. Surprisingly little press has been given to these alternative forms of greetings during COVID-19. Although COVID has continued in the form of new Omicron variants that are noted to be as contagious as the lockdown Delta variant, even the more intimate and potentially more infectious hugging has returned as a popular form of greeting.

Hugging

Hugging is perhaps the most intimate of the greeting behaviors. Surprisingly, it has received very little research attention during the last few years. This could relate to its already being well-documented in the literature and/or it could relate to the difficulty recruiting participants for hugging research during COVID.

In one of the only two studies on hugging in the recent literature, the influences of duration and gender were determined for hugging (Dueren et al, 2021). In that study, one-second hugs were less pleasurable than 5 and 10-second hugs, but only women were recruited for this study. It's not clear why only women were recruited for the study given that women have been noted to enjoy embracing more than men in previous studies (Field, 2019). A comparison between genders would have made an important contribution to this recent literature. In the second study, romantic partner embraces were

assessed (Berretz et al, 2022). The romantic partner embraces reduced cortisol levels, but only in women, likely as already mentioned because women simply enjoy embracing more than men.

Affectionate Touch

Affectionate touch has been used for stress reduction, pain alleviation and facilitating relationships. Again, in an increasing order of intimacy, these forms of touch include simple touching, handholding, holding, caressing and kissing.

Simple touching

Simple touching is rarely studied on its own as most studies have involved more active touching. But simple touching by parents has been effective in reducing children's stress and touching by partners has also been stress-reducing. In a study on parental touch called "Parental touch reduces social vigilance in children", 8-to-10-year-old children were less threatened by angry face stimuli when the parents simply patted the child on the shoulder (Brummelman et al, 2019). Socially anxious children were especially calmed by being patted on the shoulder. Adolescents were not affected by this simple form of touching which wasn't surprising, but they typically shy away from touching, even when offered a massage (Diego et al, 2002).

In a study entitled "Partner touch enhances cognitive control", partner touching during a cognitive task decreased stress and increased goal-directed behavior (Saunders et al, 2018). Although both studies highlight the calming effects of simple touch, they are within-subjects studies rather than randomized group comparisons of different types of touch.

Handholding

In a randomized crossover study, handholding was compared with standing-beside-a-partner for five minutes (Sakuma et al, 2021). In the handholding condition, heart rate variability increased in both the patients and their caregivers. The increased heart rate variability

suggests a reduction in stress. A comparison of different forms of touch would have contributed to the literature showing that there's increased heart rate variability following at least moderate pressure touch (Field et al, 2010). In addition, exploring that mechanism would have added to this study.

In a study on emotional pain, handholding was noted to reduce emotional pain (Sahi et al, 2021). In this paradigm, handholding was compared to squeezing a ball while recalling an emotional experience. While there was no immediate effect on reducing emotional pain during the task, there were increased feelings of comfort. And later recall of the emotionally painful experiences while handholding was associated with less pain. It is surprising that there was no immediate effect on reducing emotional pain during the task given that touch has been used repeatedly to reduce physical pain. Exploring the difference between emotional and physical pain following touch would be an interesting comparison.

In a study called "Brain to brain coupling during handholding associated with pain reduction", romantic partners were assigned to being a target pain receiver or a pain observer while EEG was recorded (Goldstein et al, 2018). The conditions were pain/no pain and touch/no touch. Coupling occurred in the central regions of the brain for the target of pain and the right hemisphere of the brain for the observer of pain. Brain coupling, in turn, was correlated with analgesia magnitude for the pain target and with empathic accuracy of the observer. It's not clear how inflicting pain could have received Institutional Review Board approval. Presumably the pain was not that severe. The pain in the target and the empathy of the observer seem to have activated different regions of the brain, so it is not clear why this was referred to as "brain to brain coupling" and how the coupling itself was correlated with analgesia. And, the association between analgesia in the target and empathic accuracy in the observer needs clarification.

In a study entitled "Supportive handholding attenuates the pupillary response to stress in couples", 40 couples were randomly assigned to handholding versus no handholding during a Stroop Stress Test (Graff et al, 2019). In the handholding condition, there was less pupil dilation and faster habituation to the Stroop Stress Test. Exploring different forms of touch would have been more informative for this literature than comparing handholding with no handholding. Further, it seems that the primary finding of less pupil dilation as an index of reduced stress was diminished by the finding of the response to the Stroop Stress Test, as if the researchers thought that a behavioral confirmation of the physiological findings was necessary. In still another study on handholding, 45 student couples held hands during conflict discussions (Conradi et al, 2020). Handholding during these discussions led to decreased heart rate and increased heart rate variability, suggesting a decrease in stress. While handholding during the conflict discussions decreased heart rate and increased heart rate variability, it is not apparent that there was a randomized control group. And, a discussion of a potential underlying mechanism for increased heart rate variability would have added to this study.

Holding/cuddling

Holding/cuddling has been increasingly popular in the United States and in England and perhaps other countries based on the increasing number of cuddling groups, cuddle shops and cuddle therapists. Despite this trend, no studies could be found on this cuddling practice, perhaps because having researchers present to record/assess cuddling effects might be considered intrusive. And, only one study could be found in the recent literature on holding. In that study called "Affect contagion between mothers and infants" (Waters et al, 2017), the mother-infant dyads (N=88 dyads, 12-14 month-old infants) experienced a stressful separation protocol where mothers left the room and after a brief period, infants were returned to their

mothers' laps or to a highchair. The infants who sat on their mothers' laps showed increased vagal activity (heart rate variability), a sign of reduced stress. These results were not surprising given that these effects had been noted in a previous study following a similarly stressful separation in infants as young as 3-months-old (Field et al, 2007).

Caressing

Caressing touch is increasingly being used as a label for what was originally called C-tactile touch (CT touch) (see Field, 2019 for a review). CT touch was defined as slow, gentle stroking that stimulated unmyelinated afferents found only in the hairy skin. In the original experiments, slow gentle stroking was applied by a wooden hand to the hairy forearm of the participant. That, in turn, stimulated the unmyelinated afferents that led to the posterior insular cortex (a reward center of the brain) (Morrison et al, 2011). In more recent studies, the human hand has been used to apply the slow gentle stroking to the hairy forearm and the touch that was rated as pleasant was increasingly labeled social affective touch (Cascio et al, 2019).

Countless studies have been conducted on CT touch over the last couple decades, although only a few examples are presented here. In a more comprehensive review, all ages are said to experience CT touch (Cascio et al, 2019). In a study on fetuses, for example, third trimester fetuses were noted to respond more to CT touch on the mother's abdomen than second trimester fetuses based on the fetuses touching the intrauterine wall (Marx & Nagy, 2017). Fetal responses to maternal touch had been shown in an earlier study, but to touching the soles of the mother's feet. And this protocol involved moderate pressure touch and the glabrous skin of the feet (Diego et al, 2002). These data suggest that the stimulation of both hairy and glabrous skin can lead to a fetal response.

Further question about the exclusivity of the hairy skin responding to CT touch came from a CT touch study on children's responses that were tuned to the velocity of CT touch but not the

location given that the children responded to touch on both hairy and glabrous skin (Haggarty et al, 2021). Further, aging folks have been noted to respond to this touch on their forearms "into their ninth decade of life" even though folks at that age have very little hair on their forearms (Sehlstedt et al, 2016). And, experimenters who have given CT touch have also reported a pleasant experience from touching someone else even though they have provided the touch with the glabrous surface of their hands (Gentsch et al, 2015).

Other types of touch have also been classified as social affective touch. For example, one of the CT touch researchers published a paper called "Pleasant deep pressure: expanding the social touch hypothesis" (Case et al, 2021). This group developed a massaging cuff which showed different afferents being stimulated than the CT touch afferents, but the authors, nonetheless, referred to the response to deep touch as social affective touch.

In a study called "Reading the mind in the touch", optimal CT touch was compared to non optimal CT touch (Kirsch et al, 2018). Slow gentle touch was rated as conveying arousal, lust or desire. The authors then suggested that the primary function of CT touch is to enhance the central salience of tactile interactions. Although this rating scale is a unique contribution of this study, it is surprising that this rating scale on arousal, lust or desire was not used in earlier CT touch studies inasmuch as the original description of the touch as slow and gentle stroking would be imagined to be arousing.

Still further question about the specificity of CT touch came from a meta-analysis presented in a paper entitled "Pleasantness ratings in response to affective touch across hairy and glabrous skin" (Cruciani et al, 2021). Several articles reporting "pleasantness" responses in this meta-analysis did not differentiate hairy and glabrous skin for those responses. And, in one of the recent studies, afferent fibers were detected in glabrous skin. The authors concluded that their meta-

analysis included heterogeneous studies that were significantly variable in their results.

Kissing

Kissing is probably one of the most intimate forms of affectionate touch, although it has received very little attention in the literature. Only one study could be found that addressed kissing and that research also included data on cuddling and massage (Herbenick et al, 2019). In this very large sample study (N =1493), the prevalence of different kinds of touch was assessed for partners. Kissing was noted by 87% of the partners, cuddling by 70% and massage by 23%. It is somewhat surprising that the more intimate touch of kissing occurred more often than cuddling which is usually reported as the preferred form of partner affection, at least by women. The low prevalence of massage is not surprising given that most people lack confidence in performing massage on their partners, and certainly during this period of time (COVID), people were reluctant to go to a massage therapist for any type of massage instruction.

Touch deprivation

Touch deprivation has most recently been illustrated by prevalence figures of different types of touching during COVID lockdowns (Field et al, 2021). In this survey, as many as 60% of adults reported being touch deprived. In addition, only 21% of parents reported touching their children “a lot” and only 38% of adults reported touching their partner a lot (Field et al, 2021). In another study on touch deprivation, 1746 adults were surveyed during social distancing (von Mohr et al, 2021). This survey included questions about intimate, friendly and professional touch. Even though intimate touch was most frequently reported, it was also the most craved form of touch, especially by anxiously attached individuals. It was not surprising that intimate touch was craved especially by anxiously attached individuals since those individuals typically crave any kind of attention. And, the opposite type of attachment, namely avoidant attachment, is

usually associated with the avoidance of touch. It would have been interesting to compare those two types of attachment on the three types of touch they surveyed including intimate, friendly and professional touch.

Touch deprivation may have been happening before COVID-19. In an airport departure gate study, for example, touching only occurred 4% of the time (Field et al, 2021). In this study based on 30-second observations of 1360 individuals, the greatest percent time (73% time) was spent on cell phones texting and/or scrolling.

Buffers for touch deprivation have included exercise and the possible use of robot touch. In the case of the COVID lockdown study, exercise was an effective buffer (Field et al, 2021). That was not surprising inasmuch as exercise is noted to have massage-like effects resulting from moving the skin and the stimulation of pressure receptors under the skin (Field, 2019). In a substitute touch study, a human shaped pillow called a “Hugvie” was used as a communication device during werewolf games that were modified so all players could win if they trusted each other (Takahashi et al, 2021). This human-shaped pillow was noted to maintain a level of trust between folks in the study.

In a robot study, guidelines were taken from human handshakes to be used to develop handshaking in robots (Cabibihan et al, 2022). The three phases of a human handshake including reaching, contact and return were effectively mimicked by a social robot. In another robot study called “The persuasive power of robot touch”, those who were touched by a robot (N=48 students) were more responsive to requests by the robots (Hoffmann et al, 2021). Those participants also smiled and laughed more at the humanoid robot that touched them. Comparisons between robot and human touch could not be found in the literature, probably because the results would be highly predictable. However, the Hugvie or a robot might be welcomed by those living alone who were noted to be the most touch deprived during lockdowns (Field et al, 2020).

Touch as therapy

Touch as therapy has included several different types of touch, e. g. cuddling, caressing and handholding during painful procedures and

massage therapy for different medical and psychiatric conditions. A few examples of each of these are given here. Although massage therapy is a voluminous literature on its own, only a few examples are given here.

Table 1. Touch for social engagement (and first authors).

Touch Type	First Author
Greeting Touch	
Shaking hands	Massie, Nagy, Skrbekk, Schroeder
Fist bump/elbow bump	Ghareeb, Mela, Ahlmedi
Hugging	Duerin, Berretz,
Affective Touch	
Simple touching	Brummelmann, Saunders
Handholding	Sakuma, Sahi, Goldstein, Graff, Conradi
Holding/cuddling	Waters
Caressing	Cascio, Marx, Haggarty, Gentsch, Case, Kirsch, Cruciana
Kissing	Herbenick

Table 2. Touch deprivation and buffers (and first authors).

Deprivation	Field, Von Mohr
Buffers (exercise and robots)	Field, Takahasn, Cabibihan, Hoffman

Table 3. Touch as therapy (and first authors).

Touch type	First author
Hugging	Berianand
Cuddling	Horaru, Hignell
Handholding	Shaughnessy, Siramka
Massage therapy	Naruse, Gentile

Caressing and Hugging

These touch therapies have been most frequently used with neonates in intensive care units to reduce pain associated with invasive procedures like venipuncture. Caressing and hugging have been effectively used to manage the pain associated with venipuncture in young infants (Berianand et al, 2020). It is not clear whether a randomized control group was used in this study as it seemed to be a repeated measures protocol assessing the before and after pain of the infants following the caressing and hugging during venipuncture.

Cuddling

Cuddling has also been used to both reduce distress associated with Invasive procedures in neonatal intensive care nurseries as well as to decrease the length of stay in those units. In a study on cuddling during venipuncture (N= 78 neonates), holding, cuddling and sucrose were explored for pain relief (Hoarau et al, 2021). Sucrose, sucking and holding combined led to a greater decrease in pain than sucrose and sucking alone. This phenomenon, i. e. the greater effectiveness of three simultaneous therapies versus two has been reported in many studies on pain reduction. It is not clear why groups of holding, cuddling or sucrose alone were not compared in this study. Rather, three

therapies were compared to two therapies without an indication of how much variance was explained by any of these therapies. In another study called “The infant cuddler study”, the length of stay for newborns in the neonatal intensive care unit was reduced by 6.37 days (Hignell et al, 2019). This study focused on neonates with neonatal abstinence syndrome which limits its generalizability for other neonates.

Handholding

A couple applications have been noted for handholding during invasive and preoperative procedures in adults. For example, in one study entitled “The value of handholding during intravitreal injections”, researchers compared gloved with ungloved handholding on anxiety prior to Injections for retinal conditions (N=195 patients) (Shaughnessy et al, 2022). The patients’ anxiety levels were significantly reduced when their hand was held gloved or ungloved for that procedure. Both of these protocols would seem to be effective because in either case, pressure receptors were being stimulated by the handholding which would seem to be the therapeutic mechanism rather than the skin-to-skin contact per se.

In another study, 98 adults undergoing laparoscopic surgery were randomly assigned to three groups including an anxiolytic medication alone, a handholding plus conversation group and a handholding plus conversation plus anxiolytic medication group (Sriramka et al, 2021). Once again, the group that received three therapies combined including handholding, conversation and anxiolytic medication, had less anxiety and lower heart rate. However, the medication alone group had more anxiety prior to surgery. Another limitation of this study is that it did not have a handholding-only control group.

Massage Therapy

Massage therapy has been used effectively in hundreds of conditions (Field, 2021). The underlying mechanism that has been explored is the stimulation of pressure receptors under the

skin that then leads to increased vagal activity (heart rate variability), the reduction of stress hormones, most specifically cortisol, the increase of “feel good” catecholamines including serotonin and dopamine and ultimately the increase in natural killer cells that ward off bacterial, viral and cancer cells (Field, 2021). This mechanism may help explain the variety of conditions that are alleviated by massage therapy. In this review only a couple examples are given.

In a study entitled “Positive massage”, “relational well-being” increased in couples (N=34) after providing each other massages three times per week during COVID (Naruse et al, 2021). Given that only a third of couples provided each other a lot of touch during COVID (Field et al, 2021), the provision of massages for each other would have compensated for the touch deprivation being experienced.

In a study on outpatient cancer patients (N=572), oncology massage was more effective than healing touch in reducing pain (Gentile et al, 2018). This result was not surprising inasmuch as massage involves the stimulation of pressure receptors under the skin while healing touch typically doesn't even involve touching the skin. However, methodological problems also limit this study including a lack of random assignment and greater pain that was noted in the healing touch group at baseline.

Methodological Limitations

Several methodological limitations can be noted for this literature. The primary limitation has been the difficulty recruiting participants for studies on touch given the touch prohibitions during COVID. But despite that limitation, the studies that have been conducted, while clearly showing that touch has calming effects, could have had more interesting comparisons of different forms of touch. So, for example, several controls didn't involve touch such as standing next to a crib versus holding an infant and squeezing a ball versus handholding. A more meaningful comparison, for example, was the gloved versus ungloved handholding control condition. And

that comparison yielded no differences, likely because pressure was being applied in both conditions which would be expected to lead to the positive effects of touch. The calming effects of touch have been noted in studies across the decades suggesting that these more recent studies are merely replicative rather than introducing new material like comparisons between different forms of greeting touch, affectionate touch and touch as therapy. In addition, the research samples have been small and, in some cases, they have been limited to female participants. Further, they have not used touch alone as a comparison condition but have rather combined it with other therapies like medication and conversation, thus confounding the effects of touch alone. As has been mentioned for the studies on caressing, the protocols have been extremely heterogeneous with significant variability in the results.

Conclusions

This narrative review includes summaries of research on touch for social engagement and for therapy. Touch for social engagement includes greeting touch, affectionate touch and buffers for touch deprivation. Typical greeting behaviors including shaking hands and hugging were superseded by fist and elbow bumping following safety concerns during COVID-19 lockdowns. Affectionate touch, as in handholding, cuddling, caressing and kissing, have received less recent research attention likely because of the difficulty recruiting participants for affectionate touch during COVID. Instead, touch deprivation has been common including data suggesting that as many as 60% of adults reported being touch deprived, only 21 % of children were being touched a lot and only 38% of partners were being touched a lot during COVID lockdowns. This level of touch deprivation may have preceded COVID based on an airport gate study showing that people were only touching 4% of their waiting time as they were spending most of their time on cell phones scrolling and texting. Although natural activities have been noted to compensate for touch deprivation such as

exercise, several studies have attempted to simulate social touch in robots. Touch as therapy has included several different types of touch including cuddling and handholding during painful procedures and massage therapy for innumerable medical and psychiatric conditions. The underlying mechanism for the positive effects of touch involves the stimulation of pressure receptors, as in moving the skin, resulting in a slowing of the nervous system including increased heart rate variability, less stress hormone (cortisol), and the increased production of healthy neurotransmitters and natural killer cells to ward off bacterial, viral and cancer cells. Methodological limitations of this recent literature highlight the need for additional research. Nonetheless, this recent research like that of several decades highlights the power of touch both as social engagement and therapy.

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