

**The Romantic Buffer: The Effect of Affective Touch by Romantic Partner on Itch
Experience**

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Abstract

Introduction: The sensation of itch on the skin starts when neurons called the C afferents are activated. Affective touch, slow touch that activates C tactile afferents, can inhibit an itch response. This study investigates whether affective touch by romantic partner has a greater inhibiting effect on itch experience and if this effect is moderated by an anxious attachment style. It also investigates whether awareness to bodily sensations affects itch experience.

Method: Itch was electrically induced for 6 minutes during 5 different conditions: affective touch by romantic partner or researcher, non-affective touch by romantic partner or researcher and a control condition where no tactile stimulation was applied. VAS-scale measurement of itch was conducted every minute.

Results: Affective touch by romantic partner did not have a greater inhibiting effect on itch, which was not moderated by attachment style. Participants with a higher awareness to bodily sensations experienced the itch more intensely.

Discussion: The absence of the effect of affective touch is most likely due to tactile desensitization, indicating that the method of itch induction should be altered. It should also be considered that attachment style has an indirect effect on itch experience via coping style, rather than a direct effect. Lastly, results suggest that people with a higher attentional focus to bodily sensations experience itch more intensely.

Conclusion: This study should be used as a steppingstone for future research using a new method for inducing itch and a design that is more considerate to the influence of attentional focus.

The Effect of Affective Touch by Romantic Partner on Itch Experience

A major symptom of skin diseases and various systematic diseases is chronic itch, also defined as pruritus (Ikoma et al., 2003). Itch is known to be an unpleasant sensation and helps to defend the skin against harmful agents from the external environment (Ikoma et al., 2003; Mochizuki & Kakigi, 2015). Itch symptoms are often treated with antihistamines, though this does not work in a great deal of chronic itch patients (O'Donoghue & Tharp, 2005; J. Song et al., 2018). When left untreated, itch symptoms cause physical damage, painful open skin, and open wounds. It can also result in the development of depressive symptoms, impairment of sleep and global distress (Kini et al., 2011). It is estimated that the lifetime prevalence of chronic itch is 25.5% (Matterne, Apfelbacher, Vogelgsang, Loerbroks, & Weisshaar, 2013), increasing the importance to expand the treatment options that are currently very sparse (J. Song et al., 2018; Summey & Yosipovitch, 2005).

The sensation of itch on the skin starts when neurons called the C afferents that are located on hairy skin are activated. These C afferents are unmyelinated, therefore the conduction of these neurons is slow (A.D. Craig, 2002; Vallbo, Olausson, & Wessberg, 1999). After the C afferents are activated, the signal travels through the dorsal horn of the spinal cord to the thalamus. The thalamus will then activate cortical and subcortical regions (Akiyama & Carstens, 2013; Dhand & Aminoff, 2014). The activated regions together process the feeling of itch on the skin and attach an interpretation to this sensation. There are two main pathways to be distinguished after the signal reaches the thalamus, the motoric pathway, and the emotional pathway. In the motoric pathway the signal travels through the ventral medial nucleus of the thalamus to the sensorimotor cortex, whereas the signal in the emotional pathway travels through the medial dorsal nucleus of the thalamus to the anterior cingulate cortex (ACC). The involvement of the motor cortex in the neural processing of itch may explain the urge to scratch when an itching sensation is present (Wallengren, 2005). The ACC is a relay for emotional processing, including romantic love (H. Song et al., 2015), and activation of this brain area can explain the affective component of itch (Wallengren, 2005). More specific, the ACC is involved in the evaluative processing of itch and attaches the accompanying emotions, motivations and behaviours to this sensation (Craig, 2008; He et al., 2016). The experienced intensity of itch depends on the amount of attentional focus. A higher amount of focus on the itch symptoms increases the amount of experienced itch (Van Laarhoven, Kraaijmaat, Wilder-Smith, & Evers, 2010).

Most treatment options are developed on the basis of acute itch (Sutaria et al., 2022). There is still a lot to uncover about chronic itch, which would help in the development of

treatment options. Researchers did discover that there is a stimulus that can reduce itch, namely pain. When a painful sensation is administered, the same brain regions are activated as to when we experience itch (Bourne, Machado, & Nagel, 2014; Dhand & Aminoff, 2014; Peyron & Faillenot, 2010). The inhibiting effect of pain on itch, can explain the relieving sensation of scratching (Ikoma et al., 2003; Schmelz, 2010). By scratching the skin, interneurons are released in the dorsal horn of the spinal cord and the transduction of the itch signal is inhibited (Davidson & Giesler, 2010), and the ACC and the insula are deactivated (Papoiu et al., 2013).

Scratching to reduce itch is only a temporary solution, as it damages the skin and can lead to the feeling of more itch. However, as the pain-circuit is similar to the itch-circuit, information about the interaction of pain and different components of its circuit could be relevant in the development of new treatments for chronic itch. One of those interactions that has proven to be useful, is the one between pain and affective touch. Affective touch is mostly perceived as being pleasant and will activate C tactile (CT) afferents. These are a subgroup of the C afferents that respond to slow touch (Croy et al., 2016; Olausson et al., 2008), a type of touch we use in different kinds of close relationships and is related to the degree of reported love (Chopik et al., 2014; Sorokowska et al., 2023). Affective touch can also inhibit a pain response (Liljencrantz et al., 2017), which leads to reduced activation in the ACC and insula (Mohr, Krahe, Beck, & Fotopoulou, 2018). This led to the study of Meijer et al., where they discovered that affective touch also inhibits an itch sensation (Meijer, Schielen, van Ree, & Dijkerman, 2021). When the affective touch is administered by a romantic partner, the inhibiting effect of affective touch on pain experience is stronger (Mohr et al., 2018). It is still unclear whether this greater inhibiting effect also translates to itch experience.

Affective touch is not always perceived as being pleasant. This pleasantness of social touch can be influenced by an individual's attachment style, which is partly determined by the parent-child relationship. Attachment style includes patterns of behaviour, emotions and relational expectations that is based on previous experiences of attachment in the past (Hazan & Shaver, 1987). In interpersonal relationships, individuals can have a more secure style of attachment or varying levels of anxiety and avoidance (Mikulincer & Shaver, 2007). Individuals that score higher on anxious attachment tend to expect to be rejected and also overreact to rejection (Scharf, Oshri, Eshkol, & Pilowsky, 2014). Individuals that score higher on avoidant attachment tend to use distancing coping strategies. They will suppress their need for support and will avoid proximity to others (Holmberg, Lomore, Takacs, & Price, 2011). They also show aversive attitudes toward social touch (Ekeberg, 2017). For avoidant

individuals, the mere presence of their romantic partner will enhance higher pain experience (Krahé et al., 2014; Sambo, Howard, Kopelman, Williams, & Fotopoulou, 2010). In close relationships, anxious individuals will use and seek more affective touch (Samples-Steele, 2011) and this has a positive effect on pain reduction (Krahe, Drabek, Paloyelis, & Fotopoulou, 2016) and possibly also on itch reduction.

Affective touch may have a relieving effect on itch experience, but it has not yet been proven that affective touch by romantic partner has a greater inhibiting effect. It has also not yet been proven that an anxious attachment style in close relationships has a positive effect on itch reduction. Considering the similarity between the pain and the itch circuits it is expected that affective touch by romantic partner will have a stronger inhibiting effect on itch experience, and that higher attachment anxiety moderates this effect. Since affective touch is related to the degree of reported love, the quality of the romantic relationship is included in the study as a control condition. It is also expected that affective touch by romantic partner is experienced as more pleasant, and that higher attachment anxiety moderates this effect. As mentioned before, the intensity of the itch experience depends on the amount of attentional focus to the bodily sensation. It is expected that people with a higher susceptibility to bodily sensations will have a higher itch experience. To duplicate the results of Meijer et al. (2021), itch will be electrically induced by a DS7 electrical stimulator. The relieving effect of affective touch on itch will be measured via the administration of two different forms of touch. One of them being affective touch (stroking with a velocity of 3 cm/s), and the other being non-affective touch (stroking with a velocity of 18 cm/s). Touch will be executed by either a romantic partner, or by a neutral person (i.e. the researcher). It is expected that during the experiment, a certain degree of tactile desensitization will take place. Therefore, a control condition consisting of no touch administration is added to measure this desensitization.

Methods

Participants

10 participants and their romantic partner participated in this study, containing 3 men and 7 women ($M_{\text{age}} = 27$, ranging from 20 to 57, $M_{\text{duration_relationship}} = 47$, ranging from 7 tot 353 months). Couples were recruited via SONA Systems of Utrecht University, social media advertisement, using flyers, and by asking close friends of the researcher.

People older than 18 and younger than 64 years old that were in a romantic relationship were eligible to participate in the experiment. There were two exclusion criteria for the experiment. People with a pacemaker were not allowed to participate in the experiment. The electrical stimulation that is used to induce itch, will interfere with the

workings of the pacemaker. Also, people that suffer from itch in daily life as a symptom from a skin condition, were excluded from the experiment.

The protocol of the study was approved by the faculty ethical review board of the University of Utrecht. All participants signed a written informed consent form, to give permission for participating in the experiment.

Materials

Questionnaire

Demographical information.

Participants filled out a form to state their gender, age, highest completed education, handedness, relationship status, duration of relationship, whether they suffer from a skin condition that is causing itch and whether they are using a pacemaker.

Quality relationship

The quality of the relationship is estimated using the Quality of Relationship Inventory (QRI) short Dutch version, a reliable and valid measurement to assess social support in romantic relationships (Cousson-Gélie, De Chalvron, Zozaya, & Lafaye, 2013; Reiner, Beutel, Skaletz, Brähler, & Stöbel-Richter, 2012). The questionnaire contains 3 items about relationship support and 3 items about relationship conflict (Verhofstadt, Buysse, Rosseel, & Peene, 2006). The questions have a 4-point scale, ranging from 1 (not at all) to 4 (very much). The total score on relationship support and relationship conflict are calculated separately. Higher scores on relationship support indicate greater support and higher scores on relationship conflict indicate greater conflict with the romantic partner. A healthy relationship is considered to have a high score on relationship support and a low score on relationship conflict.

Attachment style

To measure the adult attachment style, participants filled out the Experiences in Close Relationships – Revised (ECR-R) (Fraley, Waller, & Brennan, 2000). This is a well validated questionnaire (Ravitz, Maunder, Hunter, Sthankiya, & Lancee, 2010) with 36 items that measures to what extent an individual feels insecure about the responsiveness and availability of their romantic partners (i.e. attachment anxiety), and to what extent an individual is uncomfortable with being close and depending on their romantic partners (i.e. attachment avoidance). All the questions have a 7-point scale, that results in continuous scores on attachment anxiety and attachment avoidance dimensions. To score the two dimensions, the average of the answers regarding that dimension is calculated. Items 9 and 11 are reverse scored before this average is calculated. A higher score on the attachment anxiety dimension

correlates with greater attachment anxiety and vice versa. The participants will be divided into two groups based on their anxious attachment score, high and low anxious attachment.

Pain Vigilance and Awareness Questionnaire

The awareness to bodily sensations was measured using an adjusted version of the Pain Vigilance and Awareness Questionnaire (PVAQ) (McCracken, 1997). To measure itch instead of pain, the word ‘pain’ was changed to ‘physical sensations’ (van Laarhoven et al., 2018). The Dutch version of the PVAQ has a good validity and reliability (Roelofs, Peters, Muris, & Vlaeyen, 2002), which is not altered by changing the word ‘pain’ to ‘physical sensations’. The questionnaire consists of 16 items with answer options on a 6-point scale, ranging from 0 (never) to 5 (always). Before measuring the total score of the PVAQ, items 8 and 16 were reverse scored. The total score can range between 0 and 80. A person that scores relatively high on the questionnaire, has a high attentional focus on bodily sensations.

Itch induction

The itch was induced with an electrical stimulation device, namely the Isolated Bipolar Constant Current Stimulator DS7, Digitimer, United Kingdom (Figure 1). A current stimulator has proven to be a reliable way to induce itch (Meijer et al., 2021; Van Laarhoven et al., 2017). The electrodes were attached to the ventral side of the wrist, equally alternating between the left and right wrist among the participants. To alter the default setting of the pulse duration of the DS7, e-prime 2.0 (Psychology Software Tools, 2015) was used. Pulse duration was programmed to be 50 Hz during a pulse duration of 20 ms and the pulses were only active for 0.2 ms (Meijer et al., 2021). The level of amperage (in milliamperes) depends on the participants’ experienced level of itch and was adjusted for each individual. For this, a participant was stimulated for 4 s, after which the experienced itch was rated on the Visual

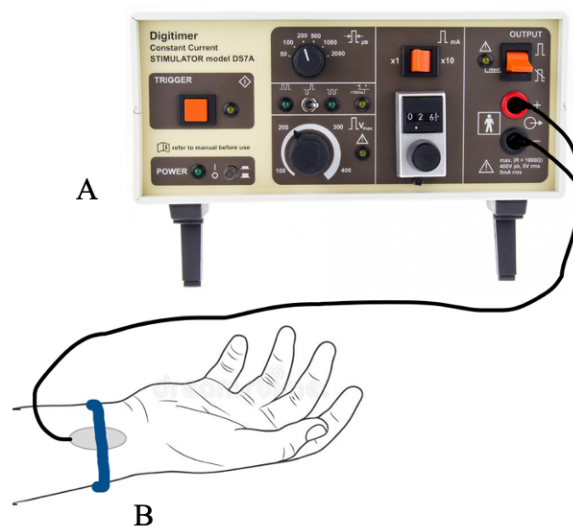


Figure 1: Experimental set-up with a constant stimulator (A) and the two electrodes attached to the ventral side of the wrist (B).

Analog Scale (VAS). The amperage was increased by steps of 0.1-0.2 mA after each VAS, until the highest rating of experienced itch on the VAS is registered (7 or higher). The amperage that gave the participant an itch sensation with VAS rating 7 or higher was used during the experiment. Whenever a participant did not experience any itch or the intensity was not rated with a three or higher, the experiment was discontinued.

Tactile stimulation

A skin area of 6 centimetres was marked on the dorsal side of the arm that received the electrical stimulation. Both the affective as the non-affective touch stimulation was executed by using a soft foundation brush. In the affective touch condition, the researcher or the romantic partner stroked the marked area over 2s (velocity of 3 cm/s). In the non-affective touch condition, the marked area was stroked 3 times per second (velocity of 18 cm/s) by either the researcher or the romantic partner.

Visual Analog Scale (VAS)

VAS for itch

The VAS is a scale from 0 to 10 that has more precision than the Likert-scale and is a reliable and valid scaling method (McCormack, Horne, & Sheather, 1988). Here, it is used to measure the amount of itch. Participants must verbally indicate the experienced itch on a scale from 0 to 10. Zero represents “no itch” and 10 represents “unbearable itch”.

VAS for pleasantness

The experienced pleasantness of stroking is also measured via a scale from 0 to 10. Here, zero represents “very unpleasant” and 10 represents “very pleasant”. The VAS is a reliable and valid assessment to measure both itch and pleasantness (Phan et al., 2012).

Procedure

Participants received information about the experiment and the online questionnaires via email after registration. The questionnaires must be filled out before the date of the experiment, to rule out non-eligible persons. Participants were requested to not take any painkillers or antihistamines 24 hours before the experiment.

Before the experiment starts, participants must read the consent form and voluntarily sign it. This form states that participants are allowed to withdraw from the experiment at any time if needed. After this, the electrodes were attached to either the right or the left arm and an area of 6 centimetres is marked on the respective arm. The romantic partner then received instructions for the affective and non-affective touch and had to demonstrate the two types of velocities to make sure that they understood the instructions.

The experiment consists of 5 conditions, 4 experimental conditions and 1 control condition. The order of these conditions is randomised for each participant. Each condition will start with a baseline measurement of itch. This is done by exposing the participant to different amperages of electrical itch for 4 seconds at a time and ask them to verbally rate the degree of itch, until an itch-level of 7 or higher is met. During the control condition, the participant received electrically induced itch for 6 minutes without any tactile stimulation. After every minute the participant must indicate the itch-score on the VAS. During the experimental conditions, the baseline measurement of itch was followed by a baseline measurement of pleasantness. Here, the marked location was stroked with a foundation brush for a total of 10 seconds and the participant must verbally rate the pleasantness of the touch. Depending on the condition, this is done by either the researcher or the romantic partner and at affective or non-affective velocities. This is followed with 6 minutes stimulation, while simultaneously receiving (non-)affective touch by either the researcher or the romantic partner. The VAS score was again registered after every minute. Between the conditions there was a 4-minute break. The experiment will last no more than 60 minutes.

Statistical analysis

All statistical analysis will be conducted with SPSS Statistics (version 28). Two participants were excluded from the analysis. One participant was excluded because she did not experience itch during the stimulation. Another participant was excluded because he only filled out the questionnaires and did not participate in the experiment.

Normal distribution will be checked with the Shapiro-Wilk test, as well as a visual check using Q-Q plots and histograms. The sphericity was violated, so the output of the Greenhouse-Geisser Epsilon will be used.

To analyse the general influence of tactile stimulation on itch experience, a repeated measures ANOVA will be conducted. The independent variables will be tactile stimulation and time and the dependent variable will be the experienced itch measured with VAS scores (averaged from both the experimenter and romantic partner condition). The analysis of the influence of romantic partner doing the tactile stimulation will also be performed via a repeated measures ANOVA. The independent variables will now be tactile stimulation, person and time, and the dependent variable will be the experienced itch measured with VAS scores. To assess if an anxious attachment style moderates the effect of tactile stimulation on itch experience, a repeated measures ANOVA will be conducted with touch, time and anxious attachment style as the independent variables, and experienced itch as dependent variable.

To analyse if pleasantness of tactile stimulation is different for romantic partner, a repeated measures ANOVA will be conducted. The independent variables will be tactile stimulation and person, and the dependent variable will be experienced pleasantness measured with VAS scores. To assess if an anxious attachment style moderates the experienced pleasantness of tactile stimulation, there will be conducted another repeated measures ANOVA. The independent variables will be tactile stimulation, person and anxious attachment style, and the dependent variable being experienced pleasantness.

Lastly, a repeated measures ANOVA will be conducted to measure if susceptibility to bodily sensations has any effect on itch experience (without any tactile stimulation). The dependent variables will be time and susceptibility to bodily sensations, and the dependent variable will be itch experience. This analysis will be repeated with tactile stimulation. The dependent variables will now be touch, time and susceptibility to bodily sensations, and the dependent variable will be itch experience. A significance criterion of .05 will be adopted for all analyses.

Results

Manipulation check

Data was checked via a visual check of the histograms and the Shapiro-Wilk test of normality, which indicated that the VAS scores for itch rating at timepoint 0 (for all 4 experimental conditions) and at timepoint 5 (for non-affective touch by researcher) violated the assumption of normality.

The experimental data of itch, pleasantness, PVAQ –, QRI – and ECR scores are displayed in Table 1. The QRI scores are divided into conflict (4.10 ± 1.10) and support ($11.50 \pm .71$). Both scores could range from 3 to 12, which means that all participants scored low on conflict and high on support.

Based on the ECR score for anxious attachment style ($2.74 \pm .77$) two groups were made, high anxious attachment style ($M = 4.78, N = 1$) and low anxious attachment style ($M = 2.52, SD = .30, N = 9$). Participants were also divided into two groups based on PVAQ-scores, high awareness to bodily sensations ($M = 49.20, SD = 2.28, N = 5$) and low awareness to bodily sensations ($M = 30.00, SD = 7.18, N = 5$).

THE EFFECT OF AFFECTIVE TOUCH BY ROMANTIC PARTNER ON ITCH EXPERIENCE

Table 1: The mean scores, SD and range of VAS scores of itch experience (for affective touch by researcher, affective touch by romantic partner, non-affective touch by researcher, non-affective touch by romantic partner and control condition), VAS scores of pleasantness, PVAQ scores, QRI scores and ECR scores ($N = 10$).

	Affective touch		Non-affective touch	
	Mean \pm SD	Range	Mean \pm SD	Range
Researcher				
Timepoint 0	7.25 \pm .35	7.00 – 8.00	7.10 \pm .32	7.00 – 8.00
Timepoint 1	5.40 \pm 1.74	2.50 – 7.50	5.50 \pm 2.01	3.00 – 9.50
Timepoint 2	5.25 \pm 2.00	2.00 – 8.00	5.05 \pm 2.17	2.00 – 9.00
Timepoint 3	4.85 \pm 1.81	2.00 - 8.50	5.10 \pm 2.00	2.50 – 8.50
Timepoint 4	4.30 \pm 2.20	1.00 – 9.00	4.30 \pm 2.28	1.00 – 7.50
Timepoint 5	4.15 \pm 2.51	1.00 – 9.00	4.30 \pm 2.39	1.50 – 7.50
Timepoint 6	3.80 \pm 3.02	0.00 – 9.00	4.35 \pm 2.68	1.00 – 7.50
Pleasantness VAS	5.70 \pm 1.25	4.00 – 8.00	4.20 \pm 1.48	2.00 – 6.00
Romantic partner				
Timepoint 0	7.10 \pm .21	7.00 – 7.50	7.05 \pm .16	7.00 – 7.50
Timepoint 1	5.10 \pm 2.18	1.00 – 8.00	5.10 \pm 2.70	2.00 – 9.00
Timepoint 2	4.60 \pm 1.82	2.00 – 7.00	4.50 \pm 2.60	1.00 – 8.50
Timepoint 3	4.20 \pm 1.92	2.00 – 7.00	4.70 \pm 2.80	1.00 – 8.50
Timepoint 4	3.75 \pm 1.99	1.00 – 7.00	4.30 \pm 2.66	1.00 – 7.50
Timepoint 5	3.40 \pm 1.93	1.00 – 7.00	3.90 \pm 2.94	0.00 – 8.00
Timepoint 6	4.10 \pm 2.40	1.00 – 7.50	4.10 \pm 3.11	0.00 – 8.00
Pleasantness VAS	6.85 \pm 1.49	4.00 – 9.00	4.80 \pm 2.06	1.00 – 8.00
Control				
Timepoint 0	7.20 \pm .42	7.00 – 8.00		
Timepoint 1	5.90 \pm 1.20	4.00 – 7.50		
Timepoint 2	5.30 \pm 1.55	3.00 – 7.50		
Timepoint 3	4.65 \pm 1.45	2.00 – 7.00		
Timepoint 4	4.20 \pm 2.15	1.00 – 7.50		

Timepoint 5	4.00±7.50	1.00 – 7.50
Timepoint 6	3.85±2.70	0.50 – 8.00
PVAQ Score	39.60±11.30	23.00 – 52.00
QRI Score		
- Conflict	4.10±1.10	3.00 – 6.00
- Support	11.50±.71	10.00 – 12.00
ECR Score		
- Anxiety	2.74±.77	2.17 – 4.78

Affective touch and itch experience

A two-way 3 (touch) x 7 (time) repeated measures ANOVA was used to measure the effect of affective touch on itch experience. The levels of touch are affective touch, non-affective touch and no touch. The levels of time are 0 minutes, 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes and 6 minutes.

There was no significant main effect for touch, $F(2,18) = .15, p = .864, \eta^2 = .016$. The itch experience, expressed in VAS scores, was not significantly lower during affective touch condition then during the non-affective touch condition or during the control condition (Figure 2). There was a significant main effect for time, $F(1.73, 15.58) = 10.41, p = .002, \eta^2 = .54$. The itch experience was significantly lower on the different time points. The interaction between touch and timepoint was not statistically significant, $F(4.58, 41.24) = .90, p = .483, \eta^2 = .54$. Because the assumption of sphericity was violated, the reported results follow the Greenhouse-Geisser correction.

A two-way 2 (touch) x 2 (person) x 7 (time) repeated measures ANOVA was used to measure the effect of affective touch by romantic partner on itch experience. The levels of touch are affective touch and non-affective touch. The levels of person are researcher and romantic partner. The levels of time are the same as previously indicated.

There was no significant main effect for touch, $F(1,9) = .11, p = .749, \eta^2 = .01$. The itch experience was not significantly lower during affective touch condition then during the non-affective touch condition or during the control condition (Figure 3). There was no significant main effect for person, $F(1,9) = 4.70, p = .058, \eta^2 = .34$. The itch experience was not significantly lower when romantic partner administered the touch then when researcher

THE EFFECT OF AFFECTIVE TOUCH BY ROMANTIC PARTNER ON ITCH EXPERIENCE

administered the touch (Figure 3). There was a significant main effect for time, $F(1.90, 17.06) = 9.36, p = .002, \eta^2 = .51$. The itch experience was significantly lower on the different time points. The interaction between touch and person was not statistically significant, $F(1,9) = .055, p = .819, \eta^2 = .006$. The interaction between touch and time was not statistically significant, $F(2.87, 25.85) = .38, p = .761, \eta^2 = .04$. The interaction between person and time was not statistically significant, $F(2.03, 18.29) = 1.26, p = .307, \eta^2 = .12$. The interaction between touch, person and time was not statistically significant, $F(3.09, 27.79) = .74, p = .54, \eta^2 = .08$. Because the assumption of sphericity was violated, the reported results follow the Greenhouse-Geisser correction.

A two-way 2 (touch) x 2 (person) x 7 (time) repeated measures ANOVA was used to measure the effect of affective touch by romantic partner on itch experience, and whether this effect is moderated by an anxious attachment style. The levels of touch, person and time are similar to the previous analysis. The between factor is anxious attachment style (high or low attachment style).

There was no significant main effect for touch, $F(1,8) = .12, p = .743, \eta^2 = .01$, and for person, $F(1,8) = .23, p = .642, \eta^2 = .03$. There was a significant main effect for time, $F(1.81, 14.50) = 4.78, p = .028, \eta^2 = .37$. The interaction between touch and anxious attachment style was not statistically significant $F(1,8) = .44, p = .525, \eta^2 = .05$. An anxious attachment style did not moderate the effect of affective touch on itch experience. The interaction between

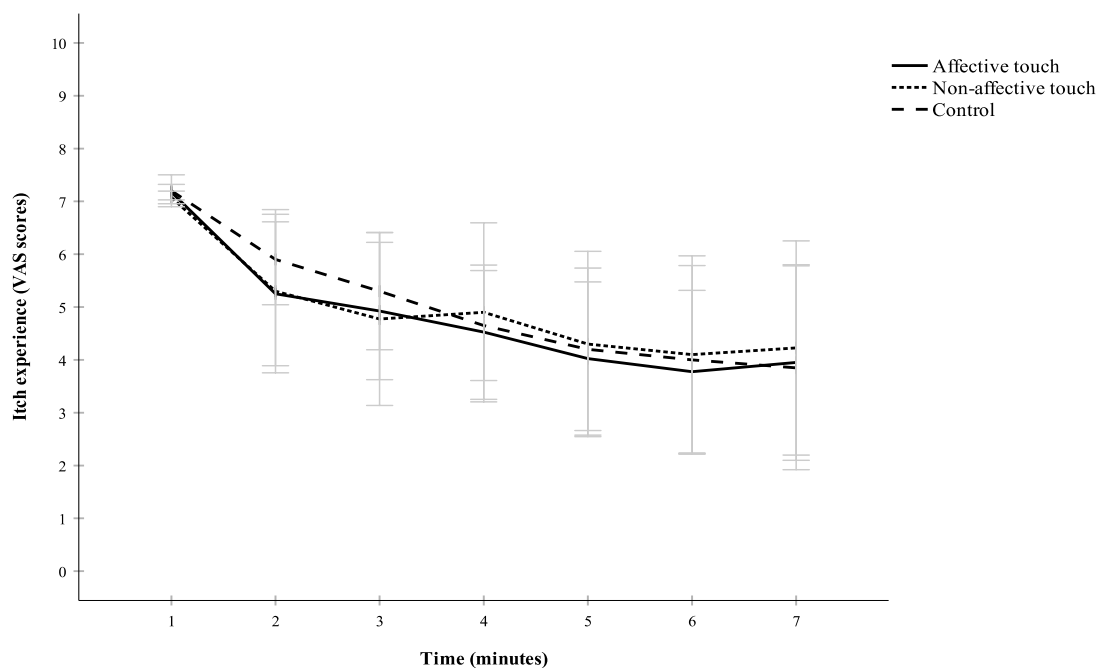


Figure 2: Itch experience (expressed in VAS scores) for itch measurement every minute per type of touch (affective touch, non-affective touch and no touch). The data points represent the average the mean VAS scores per timepoint ($N = 10$).

THE EFFECT OF AFFECTIVE TOUCH BY ROMANTIC PARTNER ON ITCH EXPERIENCE

person and anxious attachment style was not statistically significant, $F(1,8) = 1.05, p = .335, \eta^2 = .12$. An anxious attachment style did not moderate the effect of romantic partner on itch experience. The interaction between time and anxious attachment style was not statistically significant, $F(1.81, 14.50) = .82, p = .448, \eta^2 = .09$. An anxious attachment style does not moderate the itch experience over time. The interaction between touch and person was not statistically significant, $F(1,8) = .01, p = .926, \eta^2 = .001$. Affective touch by romantic partner did not have a greater inhibiting effect than affective touch by researcher. The interaction between touch, person and anxious attachment style was not statistically significant, $F(1,8) = .08, p = .781, \eta^2 = .01$. The interaction between touch and person was not moderated by an anxious attachment style. The interaction between person and time was not statistically significant, $F(1.96, 15.68) = 1.79, p = .199, \eta^2 = .18$. The interaction between person, time and

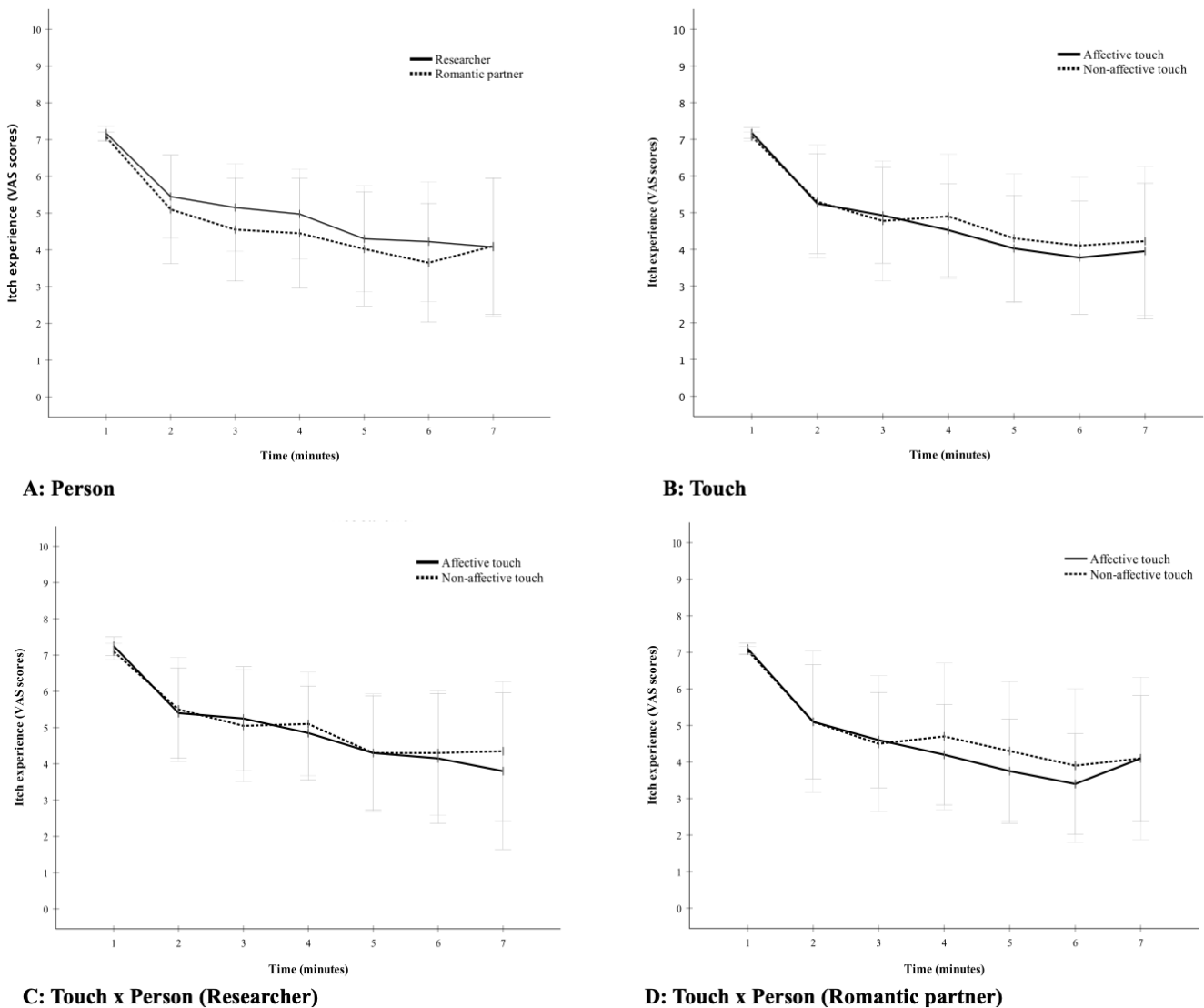


Figure 3: Itch experience (expressed in VAS scores) for itch measurement every minute per (A) person executing the touch and per (B) type of touch. (C) depicts the itch experience for itch measurement every minute per touch when the researcher executed the touch. (D) depicts the itch experience for itch measurement every minute per touch when the romantic partner executed the touch ($N = 10$).

anxious attachment style was not statistically significant, $F(1.96, 15.68) = 1.32, p = .295, \eta^2 = .14$. The interaction between touch and person was not moderated by an anxious attachment style. The interaction between touch, person and time was not statistically significant, $F(3.56, 28.52) = 1.78, p = .165, \eta^2 = .18$. The interaction between touch, person, time and anxious attachment style was not statistically significant, $F(3.56, 28.51) = 1.70, p = .183, \eta^2 = .18$. The interaction between touch, person and time was not moderated by an anxious attachment style.

Pleasantness of touch

A two-way 2 (touch) x 2 (person) repeated measures ANOVA was used to measure the effect of affective touch by romantic partner on pleasantness. The levels of touch are affective and non-affective touch. The levels of person are researcher and romantic partner.

There was a significant main effect for touch, $F(1,9) = 9.72, p = .012, \eta^2 = .52$. The pleasantness rating was significantly higher for affective touch than for non-affective touch (Figure 4). There was no significant main effect for person, $F(1,9) = 3.93, p = .079, \eta^2 = .30$. The interaction between touch and person was not statistically significant, $F(1,9) = 1.06, p =$

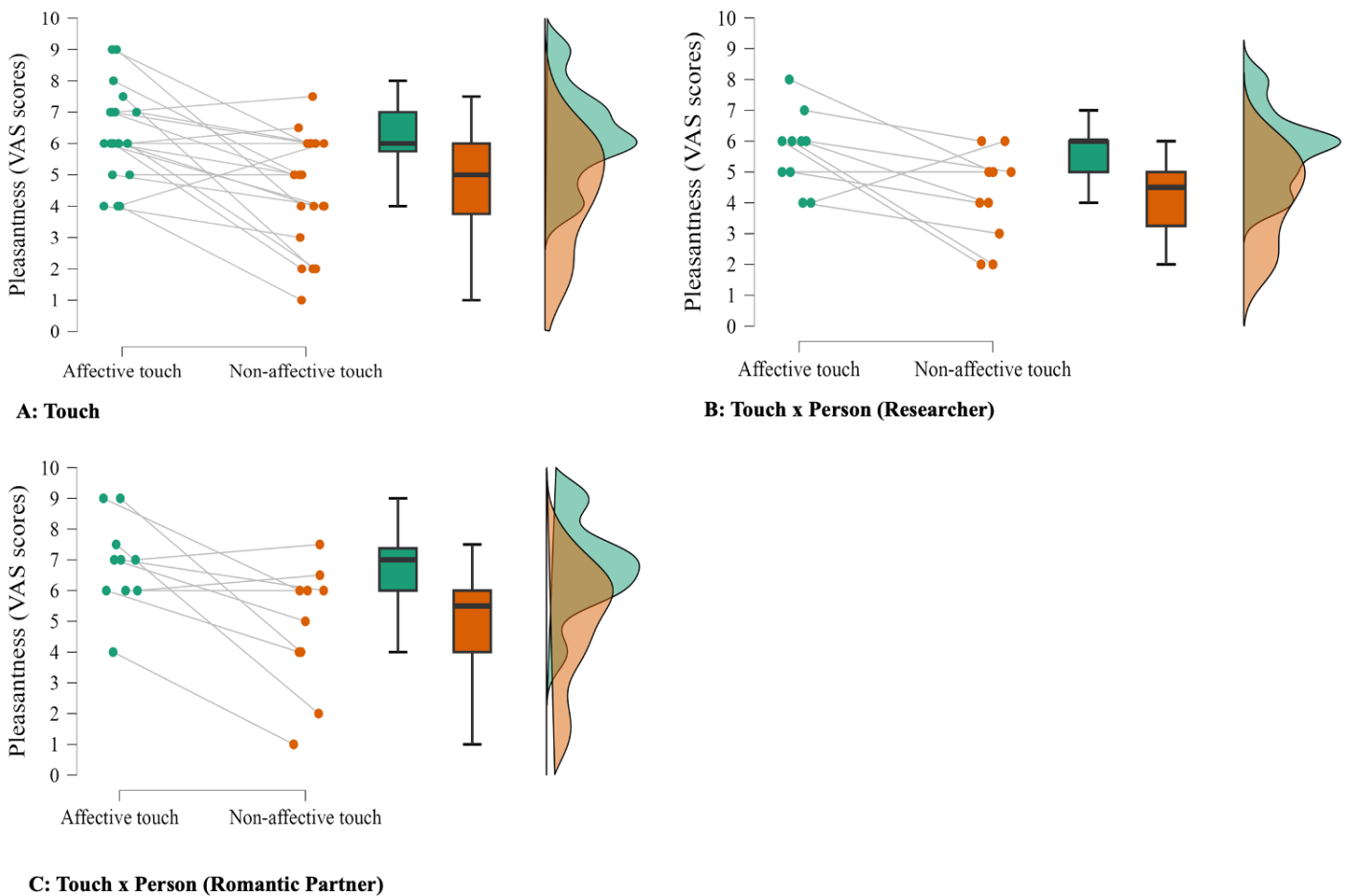


Figure 4: Pleasantness rating (expressed in VAS scores) per A. touch (affective vs non-affective) and per person executing the touch (B. Researcher and C. Romantic partner) (N = 10).

.330, $\eta^2 = .11$. The pleasantness rating was not significantly higher when affective touch was executed by romantic partner.

A two-way 2 (touch) x 2 (person) repeated measures ANOVA was used to measure whether the effect of affective touch by romantic partner on pleasantness is moderated by an anxious attachment style. The levels of touch and person are similar to the previous analysis. The between factor is anxious attachment style (high or low anxious attachment style).

There was a significant main effect for touch, $F(1,8) = 14.28, p = .005, \eta^2 = .64$. The interaction between touch and anxious attachment style was not statistically significant, $F(1,8) = 4.07, p = .078, \eta^2 = .34$. The pleasantness rating for different touches was not moderated by an anxious attachment style. There was no significant main effect for person, $F(1,8) = 1.10, p = .324, \eta^2 = .12$. The interaction between person and anxious attachment style was not statistically significant, $F(1,8) = .01, p = .931, \eta^2 = .001$. The pleasantness rating for touch done by different persons was not moderated by an anxious attachment style. The interaction between touch and person was not statistically significant, $F(1,8) = 1.10, p = .325, \eta^2 = .12$. The interaction between touch, person and anxious attachment style was not statistically significant, $F(1,8) = .32, p = .585, \eta^2 = .04$. The interaction between touch and person was not moderated by an anxious attachment style.

Susceptibility to bodily sensations

A two-way 1 x 7 (time) repeated measures ANOVA was used to measure the effect of susceptibility to bodily sensations on itch experience. The within factor is time (0 minutes, 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes and 6 minutes). The between factor is susceptibility to bodily sensations (high and low susceptibility).

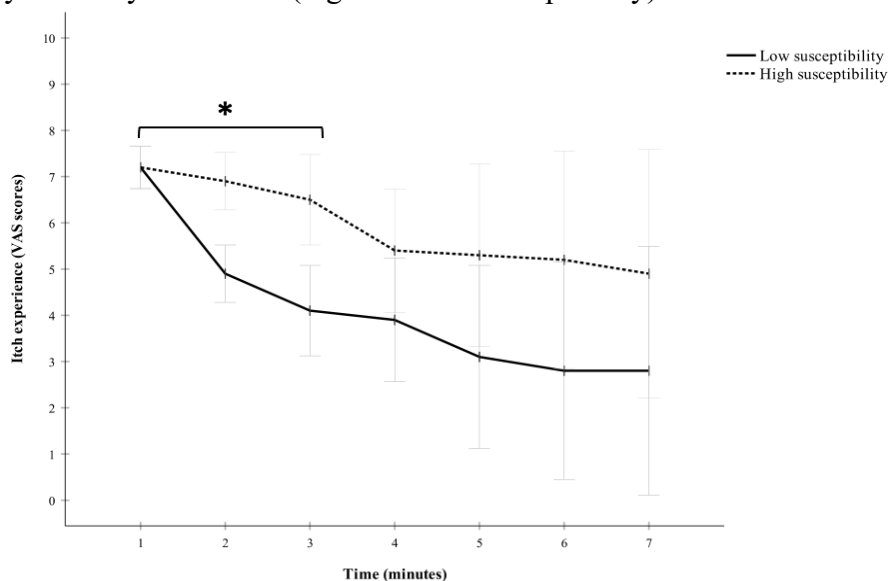


Figure 5: Itch experience (expressed in VAS scores) for itch measurement every minute per low susceptibility to bodily sensations ($N = 5$) and high susceptibility to bodily sensations ($N = 5$).

There was a significant main effect for time, $F(1.55, 12.36) = 10.85, p = .003, \eta^2 = .58$. The itch experience was significantly different over different timepoints. There was a significant main effect for susceptibility to bodily sensations, $F(1,8) = 5.30, p = .050, \eta^2 = .39$. The overall itch experience was significantly higher in persons with high susceptibility to bodily sensations. The interaction between time and susceptibility to bodily sensations was not statistically significant, $F(1.55, 12.36) = 1.33, p = .290, \eta^2 = .14$, though after visual inspection of the data (Figure 5) a contrast analysis for interaction was conducted. Timepoint 1 vs. timepoint 2 and timepoint 2 vs. timepoint 3 itch experience differed significantly, meaning that the difference of itch experience between high and low susceptibility to bodily sensations at timepoint 2 was significantly higher than timepoint 1 and at timepoint 3 was significantly higher than timepoint 2 (Table 2).

Table 2: Results of the interaction effect of susceptibility to bodily sensations and itch experience, derived from a 2x7 repeated measures ANOVA contrast analysis.

Touch x Timepoint			
Contrasts	F	p	η^2
0 vs. 1 min	15.69	.004*	.66
1 vs. 2 min	6.85	.031*	.46
2 vs. 3 min	.002	.961	.00
3 vs. 4 min	.55	.481	.06
4 vs. 5 min	.58	.470	.07
5 vs. 6 min	.11	.748	.01

For all contrast analysis, the degrees of freedom are 1,8.

* $p < .05$.

Discussion

The current study examined the effect of affective touch by romantic partner on itch experience. It was expected that affective touch executed by romantic partner would have a greater inhibiting effect on itch experience. In addition, it was expected that the inhibiting effect of affective touch by romantic partner on itch experience would be moderated by a higher anxious attachment style, and that affective touch by romantic partner is perceived as more pleasant and that this would also be moderated by a higher anxious attachment style. Lastly, it was expected that people that are more susceptible to bodily sensations would have a higher itch experience.

The main aim of this study was to examine the effect of affective touch by romantic partner on itch experience. The results suggest that affective touch by romantic partner does

not have a greater inhibiting effect on itch experience, which is not in accordance with the hypothesis. This study used the same method as Meijer et al. (2021), though it was unable to duplicate the results. Affective touch did not have a greater inhibiting effect than non-affective touch. Contrary to the study by Meijer et al. (2021), this study added a control condition where no tactile stimulation was applied. The results during the control condition suggest that itch experience slowly declines over time, without applying tactile stimulation, suggesting that the degree of tactile desensitization is greater than expected. To optimally examine the effect of tactile stimulation on itch experience, it is crucial for itch experience to remain relatively stable over time. As this was not the case in the current study, this could suggest that the current method is not the best method to induce itch.

There was also no moderation effect of attachment style on the effect of affective touch by romantic partner on itch experience. It was expected that an anxious attachment style directly affects pain intensity, and with that would also have a direct effect on itch intensity as these circuits are so similar. However, multiple studies suggest that there is no direct effect on pain (Andersen, 2012; Davies, Macfarlane, McBeth, Morriss, & Dickens, 2009). An anxious attachment style does have a direct effect on coping strategies, which has an indirect effect on pain management (Kratz, Davis, & Zautra, 2012). According to the attachment-diathesis model of chronic pain, an anxious attachment style creates a vulnerability for problematic adaptation to pain (Meredith, Ownsworth, & Strong, 2008). Patients with chronic pain tend to catastrophize their pain-stimulus, which can change their pain intensity and is therefore a predictor of pain adaptation (Kratz et al., 2012). It is possible that patients with a chronic itch condition that have an anxious attachment style, taught themselves to catastrophize their itch-symptoms. In this specific example, the anxious attachment style has a direct effect on the coping strategy, which has a direct effect on itch experience. In the current study, participants did not experience chronic itch and thus never developed a problematic adaptation to itch sensations, such as catastrophizing the itch-stimulus. This could explain the lack of a moderation effect by attachment style. Another review suggests that the attachment style of the romantic partner should also be taken into consideration, as this can affect how the participant experiences the reaction of the romantic partner on the bodily sensation and this can alter the experience of the bodily sensation (Forsythe, Romano, Jensen, & Thorn, 2012; Romeo, Tesio, Castelnovo, & Castelli, 2017). For instance, a romantic partner with an anxious attachment style is more prone to give exaggerated responses to unpleasant bodily sensations given to the participant, which intensifies the experience of the bodily sensation in the participant (Forsythe et al., 2012). These findings suggest that multiple mechanisms, such

as coping style and partners' attachment style, should be considered when measuring the effect of attachment style on bodily sensations. Future research should also include variables such as coping style of the participant and attachment style of the partner.

To determine the influence of romantic partner on pleasantness of affective touch, this study took pleasantness of (non-)affective touch done by either the researcher or romantic partner into account. The results suggest that affective touch is perceived as being more pleasant than non-affective touch. It also suggests that it does not matter who executed the touch, which could mean that the processing of the activated CT afferents is not influenced by person executing the touch. Affective touch has an evolutionary component, affection enhances survival and reproduction (Floyd & Hesse, 2021). It is expected that affective touch by romantic partner would have more effect, as the chances of survival and reproduction are higher for romantic partner than for the researcher. These results suggest that participants were able to discriminate between the different touches in pleasantness, but that there was no emotional component in the pleasantness of the touch. In other words, it did not matter if the person administering the affective touch was emotionally connected to the participant or not, the pleasantness of affective touch remained the same. A review by Sailer & Leknes suggests that the goal and purpose behind affective touch can influence one's affective experience (Sailer & Leknes, 2022). The goal and purpose were similar for the researcher and romantic partner, they both executed the touch to reach the goal to obtain results for the research which benefits the purpose to gain more knowledge about itch and affective touch. This suggests that the affective experience in the experiment is the same regardless of the person executing the touch. This could explain the lack of difference in pleasantness experience between different persons executing the touch. In future research it may be interesting to examine if pleasantness of affective touch also affects the inhibiting effect of affective touch.

The pleasantness of affective or non-affective touch by either the researcher or romantic partner was not moderated by an anxious attachment style, which is not in line with the hypothesis. As anxious individuals tend to seek more affective touch, it was expected that they will also perceive it as more pleasant. These results suggest that this is not the case. Higher scores in attachment anxiety is associated with reduced pleasantness discrimination between affective and non-affective touch (Krahé et al., 2018). Keeping this in mind, it is expected that an anxious attachment style lessens the difference of pleasantness in affective and non-affective touch, so it weakens the effect between pleasantness and person. To demonstrate this in the results, a significant effect between pleasantness and person is needed. As there was no significant effect in the current study, it is not possible to examine the

moderation effect. This study was unable to accept or reject the hypothesis that attachment style has a moderation effect on pleasantness of affective or non-affective touch by either the researcher or romantic partner. More research is needed to determine whether there is a moderation effect or not.

To determine if some people are more susceptible to itch, the effect of susceptibility to bodily sensation on itch experience was examined. The results suggest that participants that are more susceptible to bodily sensations, have a higher itch experience than participants that are less susceptible to bodily sensations. In other words, it suggests that someone with a higher attentional focus to bodily sensations experiences a higher level of itch when it was induced (Van Laarhoven et al., 2010). This is in line with the hypothesis. To determine if the inhibiting effect of affective touch is different in people with a higher attentional focus to bodily sensations, it is essential to seek for another method to induce itch.

As already touched upon, this study was not without its limitations. The group of participants was lower than previously calculated, lowering the intended power. The results therefore should be interpreted with caution. The results of the control condition already suggested that another method should be used for the measurement of the inhibiting effect of affective touch on itch experience. It is difficult to know for sure that participants experience the electrical stimulation as itch, and the decline of the itch experience over time suggests that there is a tactile desensitization. A new method was found to induce itch on a more natural manner, namely the cowhage plant. The itch that this plant induces resembles the characteristics of an itch from chronic conditions, as there is no involvement of histamine (Papoiu, Tey, Coghill, Wang, & Yosipovitch, 2011). For further research, it is recommended to use cowhage instead of electrically induced itch. It should also be considered that attentional focus influences itch. A study done by van Laarhoven et al. (2018) suggests that participants could have disengaged their attention from the itch stimulus (van Laarhoven et al., 2018), which would explain the lower levels of experienced itch. In this study, participants could have easily diverted their attention to either their romantic partner or the researcher, as they were all in the same room within eyesight of each other. In future research, the attentional focus should be taken into account in the set-up of the experiment. For instance, make sure that the participant focuses their attention on one point and make sure that only the person executing the tactile stimulation is within sight of the participant.

Conclusion

Taken together, the results are unable to support the idea that affective touch by romantic partner has a greater inhibiting effect on itch experience. The trend of the itch experience during the control condition strongly suggests that this is, next to the low sample size, mainly due to the method of inducing itch. Although the main aim of the study could not be achieved, this study was able to indicate that itch research should focus on finding another method to induce experimental itch. Next to that, results of this study also emphasize the importance to be aware of the influence of attentional focus during itch induction. This research was conducted to broaden the theoretical knowledge about affective touch and its effect on itch experience. The long-term goal is to be able to use this information for treatment options for chronic itch, though there is still a lot more information needed to reach that goal. For instance, to be able to use affective touch as a treatment option, more information about the duration or the quantity of affective touch to be effective is relevant to design a possible treatment. This study can be seen as a steppingstone to gain more insight if affective touch is even applicable as treatment for chronic itch.

References

- A.D. Craig. (2002). How do you feel? Interoception: the sense of the physiological condition of the body. *Nature Reviews Neuroscience*, 3(August), 655–666.
- Akiyama, T., & Carstens, E. (2013). Neural processing of itch. *Neuroscience*, 250, 697–714. <https://doi.org/10.1016/j.neuroscience.2013.07.035>
- Andersen, T. E. (2012). Does attachment insecurity affect the outcomes of a multidisciplinary pain management program? The association between attachment insecurity, pain, disability, distress, and the use of opioids. *Social Science and Medicine*, 74(9), 1461–1468. <https://doi.org/10.1016/j.socscimed.2012.01.009>
- Bourne, S., Machado, A. G., & Nagel, S. J. (2014). Basic anatomy and physiology of pain pathways. *Neurosurgery Clinics of North America*, 25(4), 629–638. <https://doi.org/10.1016/j.nec.2014.06.001>
- Chopik, W. J., Edelstein, R. S., van Anders, S. M., Wardecker, B. M., Shipman, E. L., & Samples-Steele, C. R. (2014). Too close for comfort? Adult attachment and cuddling in romantic and parent-child relationships. *Personality and Individual Differences*, 69, 212–216. <https://doi.org/10.1016/j.paid.2014.05.035>
- Cousson-Gélie, F., De Chalvron, S., Zozaya, C., & Lafaye, A. (2013). Structural and reliability analysis of quality of relationship index in cancer patients. *Journal of Psychosocial Oncology*, 31(2), 153–167. <https://doi.org/10.1080/07347332.2012.761317>
- Craig, A. D. (2008). Interoception and Emotion: a Neuroanatomical Perspective. In Lewis, Haviland-Jones, & Barrett (Eds.), *Handbook of Emotion* (4th ed.). New York, N.Y. : Guilford Press, [2016].
- Croy, I., Luong, A., Tricoli, C., Hofmann, E., Olausson, H., & Sailer, U. (2016). Interpersonal stroking touch is targeted to C tactile afferent activation. *Behavioural Brain Research*, 297, 37–40. <https://doi.org/10.1016/j.bbr.2015.09.038>
- Davidson, S., & Giesler, G. J. (2010). The multiple pathways for itch and their interactions with pain. *Trends in Neurosciences*, 33(12), 550–558. <https://doi.org/10.1016/j.tins.2010.09.002>
- Davies, K. A., Macfarlane, G. J., McBeth, J., Morriss, R., & Dickens, C. (2009). Insecure attachment style is associated with chronic widespread pain. *Pain*, 143(3), 200–205. <https://doi.org/10.1016/j.pain.2009.02.013>
- Dhand, A., & Aminoff, M. J. (2014). The neurology of itch. *Brain*, 137(2), 313–322. <https://doi.org/10.1093/brain/awt158>
- Ekeberg, D. (2017). The Relationship between Interpersonal Touch and Attachment

- Organization. *Stockholm University*, 1–10.
- Floyd, K., & Hesse, C. (2021). Affection exchange theory: A bio-evolutionary look at affectionate communication. *Engaging Theories in Interpersonal Communication*, 27–38.
- Forsythe, L. P., Romano, J. M., Jensen, M. P., & Thorn, B. E. (2012). Attachment style is associated with perceived spouse responses and pain-related outcomes. *Rehabilitation Psychology*, 57(4), 290–300. <https://doi.org/10.1037/a0030083>
- Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). *An Item Response Theory Analysis of Self-Report Measures of Adult Attachment*. 78(2), 350–365. <https://doi.org/10.1037//0022-3514.78.2.350>
- Hazan, C., & Shaver, P. (1987). Romantic Love Conceptualized as an Attachment Process. *Journal of Personal and Social Psychology*, 52(3), 511–524.
- He, Z.-G., Zhang, D.-Y., Liu, S.-G., Feng, L., Feng, M.-H., & Xiang, H.-B. (2016). Neural circuits of pain and itch processing involved in anterior cingulate cortex. *International Journal of Clinical and Experimental Medicine*, 9(12), 22976–22984.
- Holmberg, D., Lomore, C. D., Takacs, T. A., & Price, E. L. (2011). Adult attachment styles and stressor severity as moderators of the coping sequence. *Personal Relationships*, 18(3), 502–517. <https://doi.org/10.1111/j.1475-6811.2010.01318.x>
- Ikoma, A., Rukwied, R., Ständer, S., Steinhoff, M., Miyachi, Y., & Schmelz, M. (2003). Neurophysiology of Pruritus. *Archives of Dermatology*, 139(11). <https://doi.org/10.1001/archderm.139.11.1475>
- Kini, S. P., DeLong, L. K., Veleadar, E., McKenzie-Brown, A. M., Schaufele, M., & Chen, S. C. (2011). The impact of pruritus on quality of life: The skin equivalent of pain. *Archives of Dermatology*, 147(10), 1153–1156. <https://doi.org/10.1001/archdermatol.2011.178>
- Krahe, C., Drabek, M. M., Paloyelis, Y., & Fotopoulou, A. (2016). *Affective touch and attachment style modulate pain: a laser-evoked potentials study*. 371(1708).
- Krahé, C., Paloyelis, Y., Condon, H., Jenkinson, P. M., Williams, S. C. R., & Fotopoulou, A. (2014). Attachment style moderates partner presence effects on pain: A laser-evoked potentials study. *Social Cognitive and Affective Neuroscience*, 10(8), 1030–1037. <https://doi.org/10.1093/scan/nsu156>
- Krahé, C., von Mohr, M., Gentsch, A., Guy, L., Vari, C., Nolte, T., & Fotopoulou, A. (2018). Sensitivity to CT-optimal, Affective Touch Depends on Adult Attachment Style. *Scientific Reports*, 8(1), 1–10. <https://doi.org/10.1038/s41598-018-32865-6>
- Kratz, A. L., Davis, M. C., & Zautra, A. J. (2012). Attachment predicts daily catastrophizing

- and social coping in women with pain. *Health Psychology*, *31*(3), 278–285.
<https://doi.org/10.1037/a0025230>
- Liljencrantz, J., Strigo, I., Ellingsen, D. M., Krämer, H. H., Lundblad, L. C., Nagi, S. S., ... Olausson, H. (2017). Slow brushing reduces heat pain in humans. *European Journal of Pain (United Kingdom)*, *21*(7), 1173–1185. <https://doi.org/10.1002/ejp.1018>
- Matterne, U., Apfelbacher, C. J., Vogelgsang, L., Loerbroks, A., & Weisshaar, E. (2013). Incidence and determinants of chronic pruritus: A population-based cohort study. *Acta Dermato-Venereologica*, *93*(5), 532–537. <https://doi.org/10.2340/00015555-1572>
- McCormack, H. M., Horne, D. J., & Sheather, S. (1988). Clinical applications of visual analogue scales: a critical review. *Psychological Medicine*, *18*(4), 1007–1019.
<https://doi.org/10.1017/s0033291700009934>
- McCracken, L. M. (1997). ‘Attention’ to pain in persons with chronic pain: A behavioral approach. *Behavior Therapy*, *28*(2), 271–284. [https://doi.org/10.1016/S0005-7894\(97\)80047-0](https://doi.org/10.1016/S0005-7894(97)80047-0)
- Meijer, L. L., Schielen, Z. A., van Ree, K. Y., & Dijkerman, H. C. (2021). Affective Touch Reduces Electrically Induced Itch Experience. *Frontiers in Medicine*, *8*(February), 1–9.
<https://doi.org/10.3389/fmed.2021.628020>
- Meredith, P., Ownsworth, T., & Strong, J. (2008). A review of the evidence linking adult attachment theory and chronic pain: Presenting a conceptual model. *Clinical Psychology Review*, *28*(3), 407–429. <https://doi.org/10.1016/j.cpr.2007.07.009>
- Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: structure, dynamics, and change* (First edit). New York, N.Y. : Guilfords Press, cop. 2007.
- Mochizuki, H., & Kakigi, R. (2015). Itch and brain. *Journal of Dermatology*, *42*(8), 761–767.
<https://doi.org/10.1111/1346-8138.12956>
- Mohr, M. Von, Krahe, C., Beck, B., & Fotopoulou, A. (2018). The social buffering of pain by affective touch: A laser-evoked potential study in romantic couples. *Social Cognitive and Affective Neuroscience*, *13*(11), 1121–1130. <https://doi.org/10.1093/scan/nsy085>
- O’Donoghue, M., & Tharp, M. D. (2005). Antihistamines and their role as antipruritics. *Dermatologic Therapy*, *18*(4), 333–340. <https://doi.org/10.1111/j.1529-8019.2005.00034.x>
- Olausson, H., Cole, J., Rylander, K., McGlone, F., Lamarre, Y., Wallin, B. G., ... Vallbo, Å. (2008). Functional role of unmyelinated tactile afferents in human hairy skin: Sympathetic response and perceptual localization. *Experimental Brain Research*, *184*(1), 135–140. <https://doi.org/10.1007/s00221-007-1175-x>

- Papoiu, A. D. P., Nattkemper, L. A., Sanders, K. M., Kraft, R. A., Chan, Y. H., Coghill, R. C., & Yosipovitch, G. (2013). Brain's reward circuits mediate itch relief. A functional MRI study of active scratching. *PLoS ONE*, *8*(12), 2–10.
<https://doi.org/10.1371/journal.pone.0082389>
- Papoiu, A. D. P., Tey, H. L., Coghill, R. C., Wang, H., & Yosipovitch, G. (2011). Cowhage-induced itch as an experimental model for pruritus. A comparative study with histamine-induced itch. *PLoS ONE*, *6*(3), 1–5. <https://doi.org/10.1371/journal.pone.0017786>
- Peyron, R., & Faillenot, I. (2010). Neuroanatomy and neurophysiology of pain. *Biofutur*, *18*(311), 28–31. https://doi.org/10.1007/978-1-4939-1824-9_1
- Phan, N. Q., Blome, C., Fritz, F., Gerss, J., Reich, A., Ebata, T., ... ständer, S. (2012). Assessment of pruritus intensity: Prospective study on validity and reliability of the visual analogue scale, numerical rating scale and verbal rating scale in 471 patients with chronic pruritus. *Acta Dermato-Venereologica*, *92*(5), 502–507.
<https://doi.org/10.2340/00015555-1246>
- Ravitz, P., Maunder, R., Hunter, J., Sthankiya, B., & Lancee, W. (2010). Adult attachment measures: A 25-year review. *Journal of Psychosomatic Research*, *69*(4), 419–432.
<https://doi.org/10.1016/j.jpsychores.2009.08.006>
- Reiner, I., Beutel, M., Skaletz, C., Brähler, E., & Stöbel-Richter, Y. (2012). Validating the German version of the quality of relationship inventory: Confirming the three-factor structure and report of psychometric properties. *PLoS ONE*, *7*(5), 1–6.
<https://doi.org/10.1371/journal.pone.0037380>
- Roelofs, J., Peters, M. L., Muris, P., & Vlaeyen, J. W. S. (2002). Dutch version of the Pain Vigilance and Awareness Questionnaire: Validity and reliability in a pain-free population. *Behaviour Research and Therapy*, *40*(9), 1081–1090.
[https://doi.org/10.1016/S0005-7967\(02\)00008-6](https://doi.org/10.1016/S0005-7967(02)00008-6)
- Romeo, A., Tesio, V., Castelnovo, G., & Castelli, L. (2017). Attachment style and chronic pain: Toward an interpersonal model of pain. *Frontiers in Psychology*, *8*(FEB), 1–6.
<https://doi.org/10.3389/fpsyg.2017.00284>
- Sailer, U., & Leknes, S. (2022). Meaning makes touch affective. *Current Opinion in Behavioral Sciences*, *44*, 101099. <https://doi.org/10.1016/j.cobeha.2021.101099>
- Sambo, C. F., Howard, M., Kopelman, M., Williams, S., & Fotopoulou, A. (2010). Knowing you care: Effects of perceived empathy and attachment style on pain perception. *Pain*, *151*(3), 687–693. <https://doi.org/10.1016/j.pain.2010.08.035>
- Samples-Steele, C. R. (2011). Adult Attachment as a Predictor of Touch Attitudes and Touch

- Behavior in Romantic Relationships. *Unpublished Thesis—Degree of Bachelor of Arts With Honors in Psychology from The University of Michigan.*
- Scharf, M., Oshri, A., Eshkol, V., & Pilowsky, T. (2014). Adolescents' ADHD symptoms and adjustment: The role of attachment and rejection sensitivity. *American Journal of Orthopsychiatry*, *84*(2), 209–217. <https://doi.org/10.1037/h0099391>
- Schmelz, M. (2010). Itch and pain. *Neuroscience and Biobehavioral Reviews*, *34*(2), 171–176. <https://doi.org/10.1016/j.neubiorev.2008.12.004>
- Song, H., Zou, Z., Kou, J., Liu, Y., Yang, L., Zilverstand, A., ... Zhang, X. (2015). Love-related changes in the brain: A resting-state functional magnetic resonance imaging study. *Frontiers in Human Neuroscience*, *9*(FEB), 1–13. <https://doi.org/10.3389/fnhum.2015.00071>
- Song, J., Xian, D., Yang, L., Xiong, X., Lai, R., & Zhong, J. (2018). Pruritus: Progress toward Pathogenesis and Treatment. *BioMed Research International*, *2018*. <https://doi.org/10.1155/2018/9625936>
- Sorokowska, A., Kowal, M., Saluja, S., Aavik, T., Alm, C., Anjum, A., ... Croy, I. (2023). Love and affectionate touch toward romantic partners all over the world. *Scientific Reports*, *13*(1), 5497. <https://doi.org/10.1038/s41598-023-31502-1>
- Summey, B. T., & Yosipovitch, G. (2005). Pharmacologic advances in the systemic treatment of itch. *Dermatologic Therapy*, *18*(4), 328–332. <https://doi.org/10.1111/j.1529-8019.2005.00035.x>
- Sutaria, N., Adawi, W., Goldberg, R., Roh, Y. S., Choi, J., & Kwatra, S. G. (2022). Itch: Pathogenesis and treatment. *Journal of the American Academy of Dermatology*, *86*(1), 17–34. <https://doi.org/10.1016/j.jaad.2021.07.078>
- Vallbo, Å. B., Olausson, H., & Wessberg, J. (1999). Unmyelinated afferents constitute a second system coding tactile stimuli of the human hairy skin. *Journal of Neurophysiology*, *81*(6), 2753–2763. <https://doi.org/10.1152/jn.1999.81.6.2753>
- van Laarhoven, A. I.M., van Damme, S., Lavrijsen, A. P. M., van Ryckeghem, D. M., Crombez, G., & Evers, A. W. M. (2018). Attentional processing of itch. *Psychological Research*, *82*(5), 876–888. <https://doi.org/10.1007/s00426-017-0878-2>
- Van Laarhoven, Antoinette I.M., Kraaimaat, F. W., Wilder-Smith, O. H., & Evers, A. W. M. (2010). Role of attentional focus on bodily sensations in sensitivity to itch and pain. *Acta Dermato-Venereologica*, *90*(1), 46–51. <https://doi.org/10.2340/00015555-0743>
- Van Laarhoven, Antoinette I.M., Van Damme, S., Lavrijsen, A. P. M., Van Ryckeghem, D. M., Crombez, G., & Evers, A. W. M. (2017). Do tonic itch and pain stimuli draw

attention towards their location? *BioMed Research International*, 2017.

<https://doi.org/10.1155/2017/2031627>

Verhofstadt, L. L., Buysse, A., Rosseel, Y., & Peene, O. J. (2006). Confirming the three-factor structure of the quality of relationships inventory within couples. *Psychological Assessment*, 18(1), 15–21. <https://doi.org/10.1037/1040-3590.18.1.15>

Wallengren, J. (2005). Neuroanatomy and neurophysiology of itch. *Dermatologic Therapy*, 18, 291–303. https://doi.org/10.1007/978-1-4939-1824-9_1

Appendix A: Informed consent letter



Geïnformeerde toestemmingsformulier

Beste deelnemer,

U doet mee aan een onderzoek over jeuk. U zult verschillende voelbare sensaties ervaren, waarbij er gebruik wordt gemaakt van elektroden om jeuk te generen en een borstel waarmee u geaaid zult worden. Tijdens het experiment zal u gevraagd worden om een aantal vragen te beantwoorden. Hierbij is het belangrijk om niet te lang stil te staan bij uw antwoorden en af te gaan op uw eerste indruk.

Het onderzoek zal ongeveer 60 minuten duren. Als psychologiestudent verdient u 1,5 tot 2 PPU door deel te nemen aan het onderzoek. U kunt zich op elk moment terugtrekken uit het onderzoek, daar hoeft geen reden voor gegeven te worden. Uw gegevens worden anoniem verwerkt en uw deelname aan dit onderzoek blijft vertrouwelijk.

Door het geïnformeerde toestemmingsformulier te ondertekenen, gaat u akkoord met de algemene voorwaarden van het onderzoek.

Met vriendelijke groet,

Nikki van Zomeren
Supervisors: Zoë Schielen en Anouk Keizer

Datum: _____

Naam: _ _____

Handtekening deelnemer

Handtekening onderzoeker

E-mail deelnemer

Ik ga ermee akkoord dat de data die wordt verzameld gebruikt mag worden voor publicatie van een artikel

Ik ga ermee akkoord dat de data die wordt verzameld gebruikt mag worden voor het beantwoorden van andere onderzoeksvragen

Appendix B: Quality of Relationships Inventory (QRI) 6 items korte versie

Instructies:

Gelieve onderstaande schaal te gebruiken om volgende vragen te beantwoorden over uw relatie met (partner, moeder/vader, kind, verzorgende) ...

1= helemaal niet

2= een beetje

3= tamelijk veel

4= heel veel

- | | | | | |
|--|---|---|---|---|
| 1. In welke mate zou u zich tot deze persoon kunnen wenden voor advies omtrent problemen? | 1 | 2 | 3 | 4 |
| 2. Hoe vaak moet u uw best doen om een conflict met deze persoon te vermijden? | 1 | 2 | 3 | 4 |
| 3. In welke mate zou u bij een probleem kunnen rekenen op hulp van deze persoon? | 1 | 2 | 3 | 4 |
| 4. Hoe overstuur maakt deze persoon u soms? | 1 | 2 | 3 | 4 |
| 5. In welke mate kan u op deze persoon rekenen om naar u te luisteren wanneer u heel boos bent op iemand anders? | 1 | 2 | 3 | 4 |
| 6. Hoe boos doet deze person u voelen? | 1 | 2 | 3 | 4 |

Support: 1, 3, 5

Conflict: 2, 4, 6

Appendix C: Experiences in Close Relationships – Revised (ECR-R)

Instructies:

Gelieve onderstaande schaal te gebruiken om volgende vragen te beantwoorden over de hechting met uw partner

1 = Helemaal mee oneens

2

3

4

5

6

7 = Helemaal mee eens

	Vraag	
1.	Ik ben bang dat ik de liefde van mijn partner zal verliezen.	1 2 3 4 5 6 7
2.	Ik maak me vaak zorgen dat mijn partner niet bij mij wil blijven.	1 2 3 4 5 6 7
3.	Ik maak me vaak zorgen dat mijn partner niet echt van me houdt.	1 2 3 4 5 6 7
4.	Ik ben bang dat romantische partners niet zoveel om mij geven als om hen.	1 2 3 4 5 6 7
5.	Ik zou vaak willen dat de gevoelens van mijn partner voor mij net zo sterk waren als mijn gevoelens voor hem of haar.	1 2 3 4 5 6 7
6.	Ik maak me veel zorgen over mijn relaties.	1 2 3 4 5 6 7
7.	Als mijn partner uit het zicht is, ben ik bang dat hij of zij geïnteresseerd raakt in iemand anders.	1 2 3 4 5 6 7
8.	Als ik mijn gevoelens voor romantische partners laat zien, ben ik bang dat ze niet hetzelfde voor mij zullen voelen.	1 2 3 4 5 6 7
9.	Ik maak me zelden zorgen dat mijn partner me verlaat.	1 2 3 4 5 6 7
10.	Mijn romantische partner doet me aan mezelf twijfelen.	1 2 3 4 5 6 7
11.	Ik maak me niet vaak zorgen dat ik in de steek wordt gelaten.	1 2 3 4 5 6 7
12.	Ik merk dat mijn partner(s) niet zo dichtbij willen komen als ik zou willen.	1 2 3 4 5 6 7
13.	Soms veranderen romantische partners hun gevoelens over mij zonder duidelijke reden.	1 2 3 4 5 6 7
14.	Mijn verlangen om heel dichtbij te zijn, jaagt mensen soms weg.	1 2 3 4 5 6 7
15.	Ik ben bang dat als een romantische partner me eenmaal leert kennen, hij of zij het niet leuk zal vinden wie ik werkelijk ben.	1 2 3 4 5 6 7

THE EFFECT OF AFFECTIVE TOUCH BY ROMANTIC PARTNER ON ITCH EXPERIENCE

16.	Het maakt me boos dat ik niet de genegenheid en steun krijg die ik nodig heb van mijn partner.	1 2 3 4 5 6 7
17.	Ik ben bang dat ik me niet kan meten met andere mensen.	1 2 3 4 5 6 7
18.	Mijn partner lijkt me alleen op te merken als ik boos ben.	1 2 3 4 5 6 7
19.	Ik laat een partner liever niet zien hoe ik me diep van binnen voel.	1 2 3 4 5 6 7
20.	Ik voel me op mijn gemak als ik mijn persoonlijke gedachten en gevoelens met mijn partner deel.	1 2 3 4 5 6 7
21.	Ik vind het moeilijk om mezelf toe te staan afhankelijk te zijn van romantische partners.	1 2 3 4 5 6 7
22.	Ik voel me erg op mijn gemak als ik dicht bij romantische partners ben.	1 2 3 4 5 6 7
23.	Ik voel me niet op mijn gemak om me open te stellen voor romantische partners.	1 2 3 4 5 6 7
24.	Ik ben liever niet te dicht bij romantische partners.	1 2 3 4 5 6 7
25.	Ik voel me ongemakkelijk als een romantische partner heel dichtbij wil zijn.	1 2 3 4 5 6 7
26.	Ik vind het relatief gemakkelijk om dicht bij mijn partner te komen.	1 2 3 4 5 6 7
27.	Het is niet moeilijk voor mij om dicht bij mijn partner te komen.	1 2 3 4 5 6 7
28.	Ik bespreek mijn problemen en zorgen meestal met mijn partner.	1 2 3 4 5 6 7
29.	Het helpt om me in tijden van nood tot mijn romantische partner te wenden.	1 2 3 4 5 6 7
30.	Ik vertel mijn partner zo ongeveer alles.	1 2 3 4 5 6 7
31.	Ik bespreek dingen met mijn partner.	1 2 3 4 5 6 7
32.	Ik ben nerveus als partners te dicht bij me komen.	1 2 3 4 5 6 7
33.	Ik voel me comfortabel afhankelijk van romantische partners.	1 2 3 4 5 6 7
34.	Ik vind het gemakkelijk om afhankelijk te zijn van romantische partners.	1 2 3 4 5 6 7
35.	Ik kan gemakkelijk aanhankelijk zijn met mijn partner.	1 2 3 4 5 6 7
36.	Mijn partner begrijpt mij en mijn behoeften echt.	1 2 3 4 5 6 7

Score-informatie: De eerste 18 items hierboven vormen de schaal voor gehechtheidsangst. De items 19 tot en met 36 omvatten de gehechtheidsgerelateerde vermijdingsschaal. In echt onderzoek moet de volgorde waarin deze items worden gepresenteerd willekeurig zijn. Om een score voor gehechtheidsgerelateerde angst te verkrijgen, neemt u het gemiddelde van de antwoorden van een persoon op de items 1 – 18. Omdat de items 9 en 11 echter 'omgekeerd' zijn (d.w.z. hoge getallen vertegenwoordigen weinig angst in plaats van hoge angst), zult u moeten de antwoorden op die vragen omdraaien voordat het gemiddelde van de antwoorden wordt genomen. (Als iemand antwoordt met een "6" op item 9, moet u het opnieuw intoetsen als een 2 voordat u het gemiddelde kunt nemen.) Om een score voor aan gehechtheid gerelateerde vermijding te verkrijgen, dient u het gemiddelde te nemen van de antwoorden van een persoon op items 19 - 36. Artikelen 20, 22, 26, 27, 28, 29, 30, 31, 33, 34, 35.

Appendix D: Pain Vigilance and Awareness Questionnaire (PVAQ)

Instructies:

Gelieve onderstaande schaal te gebruiken om volgende vragen te beantwoorden over de ervaring van lichamelijke sensaties.

0 = Nooit

1

2

3

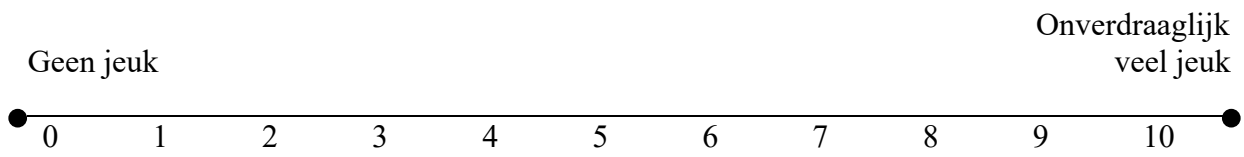
4

5 = Steeds

1. Ik ben zeer gevoelig voor lichamelijke sensaties
2. Als ik lichamelijke sensaties heb, merk ik heel goed wanneer er plotselinge veranderingen in de lichamelijke sensaties optreden
3. Ik heb snel in de gaten wanneer lichamelijke sensaties erger of minder erg wordt
4. Als ik verlichtende medicijnen neem, merk ik het effect daarvan op de lichamelijke sensaties snel op
5. Als lichamelijke sensaties veranderen van lichaamsplek, merk ik dat snel op
6. Als ik lichamelijke sensaties heb, concentreer ik me daar voortdurend op
7. Als ik lichamelijke sensaties heb, ben ik me daar zeer bewust van, zelfs wanneer ik druk bezig ben met andere activiteiten
8. Ik vind het gemakkelijk om lichamelijke sensaties te negeren
9. Ik weet onmiddellijk wanneer lichamelijke sensaties opkomen of erger worden
10. Wanneer ik iets doe dat lichamelijke sensaties kan veroorzaken, ga ik meteen na of ik inderdaad lichamelijke sensaties heb gekregen
11. Als ik lichamelijke sensaties heb, weet ik onmiddellijk wanneer het vermindert
12. Het lijkt alsof ik mij meer bewust ben van lichamelijke sensaties dan anderen
13. Ik besteed veel aandacht aan lichamelijke sensaties
14. Als ik lichamelijke sensaties heb, hou ik het niveau daarvan voortdurend in de gaten
15. Lichamelijke sensaties houden mij voortdurend bezig
16. Ik blijf niet lang stilstaan bij lichamelijke sensaties

Appendix E: VAS scales

VAS schaal voor jeuk



VAS schaal voor aangenaamheid

