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Highlights

- Highly depressed individuals have a more negative attitude towards social touch than non-to lowly depressed individuals.
- Highly depressed individuals particularly dislike physical touch by not well-known people, but not by close ones.
- Highly depressed individuals report more interpersonal problems, with the level of depression predicting the degree of interpersonal problems.
- The relationship between depression and interpersonal problems is partially mediated by the attitude towards social touch in general, and by the dislike of physical touch by people not well-known in particular.

Depression predicts interpersonal problems partially through the attitude towards social touch

Chantal Triscoli*^{1,2}, Ilona Croy³, Uta Sailer⁴

¹ Dept. of Psychology, University of Gothenburg, Gothenburg, Sweden

² Clinical Neurophysiology, Sahlgrenska University Hospital, Gothenburg, Sweden

³ Dept. of Psychotherapy and Psychosomatic Medicine, Technische Universität Dresden, Dresden, Germany

⁴ Dept. of Behavioural Sciences in Medicine, Institute of Basic Medical Sciences, Faculty of Medicine, University of Oslo, Oslo, Norway

Correspondence:

Chantal Triscoli

Department of Psychology,

Gothenburg University

Box 500,

405 30, Gothenburg

Sweden

Email: chantal.triscoli@gmail.com

Abstract

Introduction. Depression is associated with difficulties in interpersonal relationships, of which communication is an integral part. Communication can not only be effected by verbal means, but also non-verbally by touch. Against this background, the aim of the present study was to investigate the relationship between depression, interpersonal problems and the attitude towards social touch.

Methods. 147 individuals (115 females; 21-71 years old) seeking treatment in a clinic for outpatient psychotherapy took part in the survey. Three questionnaires evaluating the level of depression (Beck Depression Questionnaire), the degree of interpersonal problems (Inventory of Interpersonal Problems) and the attitude towards social touch (Social Touch Questionnaire, were administered.

Results. Highly depressed individuals had a more negative attitude towards social touch than non-to lowly depressed individuals. Highly depressed individuals particularly reported to dislike physical touch by not well-known people, but not by close ones. Highly depressed individuals also reported more interpersonal problems, with the level of depression predicting the degree of interpersonal problems. This relationship was partially mediated by the attitude towards social touch in general and, to a greater extent, by the dislike of physical touch by people not well-known in particular.

Discussion. Given the role of social touch in the relationship between depression and interpersonal problems, the attitude towards touch may be taken into consideration in the therapy of depressed patients. We assume that a more positive attitude towards social touch can influence the ability to create and maintain interpersonal relationships.

Keywords: depression; interpersonal problems; attitude towards social touch; dislike of physical touch

Introduction

Individuals with depression often report interpersonal problems. For example they find interactions less enjoyable and intimate (Nezlek, Hampton, & Shean, 2000), they are socially avoidant (Dinger, Zilcha-Mano, McCarthy, Barrett, & Barber, 2013; Huprich, Lengu, & Evich 2016), they find it difficult to be sociable, assertive and intimate (McEvoy, Burgess, Page, Nathan, & Fursland, 2013), and both adults (Dinger, Zilcha-Mano, McCarthy, Barrett, & Barber, 2013) and adolescents (Joybari, 2014) have relational difficulties that cause significant distress.

This prompts the question whether depression is the cause for interpersonal problems, or whether interpersonal problems cause depression. Using structural equation modelling, a causal effect of depression severity on relationship satisfaction was found, while the opposite effect (relationship satisfaction effecting depression) was only weak (Burns, Sayers, & Moras, 1994). This effect direction also holds for social skills: structural equation modelling revealed that depression has a direct negative impact on social skills, whereas social skills do not have an influence on depression (Cole & Milstead, 1989). In line with these findings, a longitudinal study across 14 years from childhood to adulthood showed, that the scores for social problems predict anxiety disorders, but not mood disorders (Roza, Hofstra, van der Ende, & Verhulst, 2003). Thus, there was no evidence for an influence of social problems on later depression. Along these lines, it has been argued that “social skill deficits are a manifestation of depression” ((Tse & Bond, 2004); p. 264). The authors review findings showing that a) the induction of depressed mood negatively influences social skills, b) a counter-manipulation (externally focused attention) improves the social skills of depressed individuals, and that c) treatment with antidepressant medication improves the social skills of depressed individuals.

Previous studies show that many of the interpersonal problems that depressive patients encounter are related to communication. Although one may mainly think of verbal communication, touch is also an important channel of communication, particularly in relationships between close ones. For example, social touch can convey a wide range of different messages, even more powerful than language (Jones & Yarbrough, 1985). It has also been demonstrated that different emotions can be identified from being touched by a stranger on the arm (Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006). In addition to the communicative aspect, touch is of importance for signalling attachment and affiliation to

close ones, and thus for creating and maintaining affective relationships (Field, 2010; Jakubiak & Feeney, 2017; Montagu, 1971), as for example between romantic partners (Chatel-Goldman, Congedo, Jutten, & Schwartz, 2014; Triscoli, Croy, Olausson, & Sailer, 2017) and between mother and child (Feldman, Weller, Sirota, & Eidelman, 2003; Jonsson et al., 2017). Due to this apparent importance of touch for communication of emotions and bonding (Gallace & Spence, 2010; Kirsch et al., 2017), one may expect a negative attitude towards touch to be associated with interpersonal problems.

There is reason to assume that the attitude towards social touch is altered in depression. Depression is characterized by the inability to experience pleasure from previously pleasurable activities and stimuli, for example social contacts (Brown, Silvia, Myin-Germeys, & Kwapil, 2007), pleasant tastes (Rzepa et al. 2017; McCabe et al. 2012), sexual cues (Hirschfeld, 1999), music (Satoh et al., 2011), images of happy faces (Monk et al., 2008; Kerestes, 2016) and pleasant pictures (McCabe et al. 2012). The blunted response to these types of sensory rewards makes it likely that also the attitude towards social touch is altered in depression.

Based on those considerations, the present study aimed to explore the attitude to social touch in individuals with depression, and whether depression predicts interpersonal problems and the attitude towards social touch. Since previous studies suggest that depression leads to interpersonal problems, it was investigated whether this relationship is mediated by the attitude towards social touch.

Methods

Participants and procedure

The study was approved by the regional ethical board at the University of Gothenburg and the Regional Committee for Medical and Health Research Ethics South East Norway. The study was performed in accordance with the Declaration of Helsinki.

The sample consisted of patients who sought help and were admitted to receive psychotherapy at the psychotherapy clinic of the Department of Psychology at Gothenburg University. Patients are accepted for treatment at this clinic when they show evident psychological problems which are considered to require treatment. Only patients presenting symptoms of depression and/or anxiety disorders were included in the survey. Psychotic symptoms served as exclusion criteria.

Power analysis performed *a-priori* with the program G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) revealed that, in order to obtain a medium effect size of $d=0.20$ (Cohen, 1988) for a linear multiple regression with three predictors and a power of 0.95, the optimal sample size corresponds to $N=119$. Assuming a low rate of returned questionnaires (Cummings, Savitz, & Konrad, 2001; Eaker, Bergstrom, Bergstrom, Adami, & Nyren, 1998), 300 questionnaires were handed out to the patients in the order of their appearance at the clinic. A total of 147 individuals between 21 and 71 years old (mean=35.44; sd=10.33) (115 females and 32 males) returned the questionnaires and were included in the survey.

Procedure and questionnaires

In the context of the assessment interview, the patients were asked by the psychologist whether they were willing to take part to the survey. Both oral and written information about the study was provided. The patients who gave oral consent to participate in the study received the questionnaires in a prepaid reply envelope and were requested to fill them in at home before returning them by mail. Filling in all the questionnaires was expected to take maximally 30 minutes.

The questionnaires used are all validated and reliable tools for measuring attitudes and emotions towards social touch, as well as the degree of depression and interpersonal problems. Specifically, the “Social Touch Questionnaire” (STQ) (Wilhelm, Kochar, Roth, & Gross, 2001), the “Beck Depression Questionnaire” (BDI-II) (A. T. Beck & Steer, 1987; A. T. Beck, Steer, & Brown, 2005) and the “Inventory of Interpersonal Problems” (IIP) (Horowitz, Rosenberg, Baer, Ureno, & Villasenor, 1988, 2002) were used. Both the BDI-II and the IIP are also part of the routine assessment at the patient clinic. The questionnaires were administered in Swedish.

The “Social Touch Questionnaire” (STQ) (Wilhelm et al., 2001) explores the personal attitude towards social situations involving touch in everyday life. It consists of 20 items assessing the impact of social touch on a 5-point Likert scale ranging from “Not at all” to “Extremely”. Higher scores reflect a less positive attitude towards social touch. A factor analysis of the STQ items resulted in three subscales (Vieira et al. 2016) which were named “dislike of physical touch”, describing the degree of discomfort/dislike when being touched by individuals who are not well-known (for example: “I feel uncomfortable when someone I don’t know very well hugs me”), “liking of familiar physical touch”, describing the enjoyment of affective touch from well-acquainted individuals (for example: “I like being

caressed in intimate situations”), and “liking of public physical touch”, describing a more general attitude towards physical contact with others (for example: “I generally like it when people express their affection towards me in a physical way”) (Vieira et al., 2016). In the present paper, we referred to the first subscale not as “dislike of physical touch”, as it is not the only one which describes “physical touch”. In our view, what is unique to this scale is that it describes the degree of discomfort when being touched by individuals who are not well-known by the responder. Therefore, we renamed this subscale as “dislike of physical touch from people not well-known”. The “Beck Depression Inventory” (BDI-II) (A. T. Beck & Steer, 1987; A. T. Beck et al., 2005) is a validated self-report measure and one of the most widely used instruments for assessing the severity of depressive symptoms. It consists of 21 items which are scored on a 4-point scale from 0 (symptom absent) to 3 (severe symptoms), resulting in a sum from 0 to 63. Values of 0-13 indicate minimal depression, values of 14-19 indicate mild depression, values of 20 to 28 indicate moderate depression, and values above 29 indicate severe depression. Item examples corresponding to severe symptoms are: “I feel I am a complete failure as a person”, and “I feel guilty all of the time”. The “Inventory of Interpersonal Problems” (IIP) (Horowitz et al., 1988, 2002) is a self-report instrument which assesses difficulties in interpersonal relationships. Such difficulties may consist in finding things too difficult to do (for example, joining groups or keeping things to oneself), or doing things too often or too much (for example, to get irritated or to allow oneself to be talked over). The IIP has been proven to be a sensitive measure for capturing clinically important aspects of an individual’s interpersonal functioning (Lindberg, Nevonen, Gustafsson, Nyman-Carlsson, & Norring, 2018; Lo Coco et al., 2018; Stepp, Hallquist, Morse, & Pilkonis, 2011). It includes 64 statements on a 5-point Likert scale ranging from “not at all” to “extremely”. Item examples are: “It is hard for me to trust other people”, and “It is hard for me to socialize”.

Statistical analysis

Statistical analyses were made using SPSS Statistics version 21 (IBM, Chicago, USA). First, sum scores for each patient and each questionnaire were calculated.

A median split of the BDI scores (corresponding to the cut-off = 17) was performed and the resulting groups were termed “non- to lowly” and “highly” depressed individuals. The “non- to lowly depressed” group consisted of 77 patients (19 men and 58 women), mean age=38.43, $sd=11.77$, while the “highly depressed” group comprised 70 patients (13 men and 57 women),

mean age=35.67, $sd=14.56$. These groups were then compared regarding their IIP scores, their overall scores in the attitude towards social touch and their scores in the three sub-scales using a one-way ANOVA. For those variables where the two groups were found to differ, mediation analyses were performed with Hayes' PROCESS mediation tool (Hayes, 2012). This was the case for the Inventory of Interpersonal problems (IIP), the overall attitude towards social touch and the dislike of physical touch by people not well-known. In the first mediation analysis, "depression" (BDI scores) was used as predictor (x), "interpersonal problems" (IIP scores) as outcome (y), and "attitude towards social touch" (overall STQ score), as mediator (m). In the second mediation analysis, "dislike of physical touch by people not well-known" (STQ subscale) was used as mediator (m). Bootstrapping for indirect effects was set at 5000 and confidence level at 0.95.

Mediation occurs when the strength of the relationship between a predictor variable and an outcome variable is reduced by including another variable (the "mediator") as a predictor (H. Field, 2013). The **direct effect** is the effect of the predictor on the outcome when controlling for the mediator. Mediation is tested by assessing the size of the **total effect**, which is the combined effect of the predictor and the mediator on the outcome (thus when **not** controlling for the mediator) (H. Field, 2013).

Results

Histograms for the questionnaires scores of the entire group are displayed in Figure 1.

Insert Figure 1 at about here

Fig 1. Frequency distributions, means and SD for each questionnaire. X-axis shows maximal score of each questionnaire. Vertical lines show the different cut-offs for categories of depression, as defined in the BDI manual (A.T. Beck & Steer, 2002).

Mean scores of the two groups in the questionnaire scales are shown in table 1.

Table 1. Demographic data and questionnaire scores (mean and standard deviation) for the non- to mildly and moderately depressed participant groups

Non-to lowly depressed group															
Sex		Age		BDI		IIP		Attitude towards social touch		Dislike of physical touch by people not well-known		Liking of familiar physical touch		Liking of public physical touch	
Men	Women	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd
19	58	38.4	11.8	8.6	5.2	57.4	21.8	45.2	7.6	17.2	4.4	14.6	3.5	7.9	2.5
Highly depressed group															
				BDI		IIP		Attitude towards social touch		Dislike of physical touch by not well-known people		Liking of familiar physical touch		Liking of public physical touch	
Men	Women	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd	M	sd
13	57	35.7	14.6	25.9	7.6	89.4	20.9	49.2	9.4	20.2	5.7	14.8	3.6	8.6	2.6

Inferential statistics

The highly depressed group, compared to the non-to lowly depressed group, showed a less positive attitude towards social touch (overall STQ score) ($F(1,146)=8.19, p=.005$), as well as a greater dislike of physical touch by people not well-known (STQ subscale) ($F(1,143)=12.40, p=.001$) and a higher degree of interpersonal problems (IIP scores) ($F(1,137)=77.17, p<.001$) (see Figure 3). Conversely, no differences were seen for the liking of familiar physical touch ($F(1,146)=.11, p=.74$) and for the liking of public physical touch ($F(1,145)=2.82, p=.095$) between the two groups.

As the ANOVA revealed differences between the two groups for the attitude towards social touch, the dislike of physical touch by people not well-known and the Inventory of Interpersonal problems (IIP), the relationship among these variables was further investigated using two separate mediation analyses, one with the attitude towards social touch (Model I) and the other with the dislike of physical touch by people not well-known (Model II) as mediators (see figure 2).

Insert Figure 2 at about here

Fig 2. Illustration of the mediation models calculated. Model I: mediator = attitude towards social touch; Model II: mediator = dislike of physical touch by people not well known. Paths: a = effect of the predictor on the mediator, b = effect of the mediator on the outcome, c = direct effect of the predictor on the outcome (when controlling for the mediator), c' (dotted line) = total effect of the predictor on the outcome (when not controlling for the mediator).

Depression had a direct effect on interpersonal problems (table 2, Model I, path c), i.e. when controlling for the attitude towards social touch. Depression also had a direct effect on interpersonal problems (table 2, Model II, path c) when the dislike of physical touch by people not well-known was controlled for. Indeed, depression scores alone explained 30% of

the variance of interpersonal problems when controlling for the attitude towards social touch. For each one-unit increase in BDI, there was an increase of 1.22 in the IIP score (see *b* values in table 2, Model I, path c)., Similarly, depression scores alone explained 31% of the variance of interpersonal problems when controlling for the dislike of physical touch by people not well-known. For each one-unit increase in BDI there was an increase of 1.14 in the IIP (see *b* values in table 2, Model II, path c). Moreover, depression also predicted the attitude towards social touch (table 2, Model I, path a), and the dislike of physical touch by people not well-known (table 2, Model II, path a). Thus, depression explained respectively 6% of the variance in the attitude towards social touch and 9% of the variance in the dislike of physical touch by people not well-known (compare R^2 of paths a in Models I and II, table 2). In addition, the attitude towards social touch (table 2, Model I, path b) and the dislike of physical touch by people not well-known (table 2, Model II, path b) predicted the degree of interpersonal problems. Thus, the attitude towards social touch explained 11% of the variance in the degree of interpersonal problems, while the dislike of physical touch by people not well-known explained 18% of it (compare R^2 of paths b in Models I and II, table 2).

Table 2: Regression values for attitude towards social touch (Model I) and dislike of physical touch by not well-known people (Model II) as mediators of interpersonal problems in depression

Model I							
	R^2	<i>b</i>	SE	<i>T</i>	<i>C.I.</i>		<i>p</i>
a	.06	.19	.07	2.85	.06	.31	.0051
b	.11	.64	.22	2.88	.20	1.08	.0047
c	.30	1.22	.17	6.98	.87	1.56	<.001
c'	.34	1.34	.17	7.69	.99	1.68	<.001
Model II							
	R^2	<i>b</i>	SE	<i>T</i>	<i>C.I.</i>		<i>p</i>
a	.09	.14	.04	3.56	.06	0.22	<.001
b	.18	1.43	.36	4.00	.72	2.14	<.001
c	.31	1.14	.17	6.58	.80	1.49	<.001
c'	.38	1.35	.18	7.70	1.00	1.69	<.001

Note: a = effect of the predictor (depression) on the mediator, b = effect of the mediator on the outcome (interpersonal problems), c = direct effect of the predictor on the outcome (when controlling for the mediator), c' = total effect of the predictor on the outcome (when not controlling for the mediator). R^2 = variance explained in the outcome, b = unstandardised regression coefficient; SE = standard error of the mean; T = T-value, C.I. = confidence interval

The **total effects** hence showed that the relation between depression and interpersonal problems was only weakly mediated by the attitude towards social touch and, to a slightly

greater extent, by the dislike of physical touch by people not well-known. Indeed, by adding the attitude towards social touch as a mediator (table 2, Model I, path c'), the variance explained in interpersonal problems increased only with 4% (compare R^2 of path c with R^2 of path c' in Model I, table 2), while by adding the dislike of physical touch by people not well-known to the model (table 2, Model II, path c'), the variance in interpersonal problems explained increased with 7% to 37% (compare R^2 of path c with R^2 of path c' in Model II, table 2).

Discussion

Highly depressed individuals had more interpersonal problems than non-to lowly depressed individuals. In line with previous literature (Hirschfeld et al., 2000; Kupferberg, Bicks, & Hasler, 2016) (Mc Farquhar, Luyten, & Fonagy, 2018) (Segrin, 2000), depression was associated with the degree of interpersonal problems. Highly depressed individuals also showed a less positive attitude towards social touch and, in particular, a greater dislike of physical touch by people not well-known than individuals with low or no depression. However, the attitude towards physical touch with close ones was similar in both groups. Thus, when it comes to family, friends and partners, highly depressed individuals do like to be cuddled and caressed to the same extent as individuals scoring lower in depression.

The degree of depression was also related to a less positive attitude towards social touch in general and to a greater dislike of physical touch by people not well-known in particular. One previous study already proposed a relationship between depression and reduced touch behaviour (Herrera, Reissland, & Shepherd, 2004). In this study, depressed mothers were found to touch their babies less frequently than mothers without depressive symptoms, and in turn, infants of depressed mothers touched themselves more than infants of not depressed mothers, as if compensating for the lack of tactile interactions. However, what was measured in this study was the *frequency* of physical touch rather than the *attitude* or the *dislike* towards it. Nevertheless, touch behaviour and the appreciation or attitude towards touch have been shown to be closely associated: individuals with low self-reported touch exposure (Sailer & Ackerley, 2017) and those with high touch avoidance (Hielscher & Mahar, 2016) appreciate touch to a lesser extent than people who seek and experience tactile interactions more often. Similarly, people suffering from social anxiety exhibit a similar discomfort in response to social touch (Kashdan, Doorley, Stikma, & Hertenstein, 2017).

Interestingly, the individuals' attitude towards social touch, and in particular the dislike of physical touch by people not well-known, plays a role in the relationship between depression and interpersonal problems. When considering the attitude towards physical touch by not well-known people, the variance of interpersonal problems explained by depression rose by almost one fourth (from 30 to 37%). This means that depressed individuals present interpersonal problems *partially* because they also have a less positive attitude towards social touch and greater dislike of physical touch by people not well-known. Indeed, communication by not well-known people involves aspects such as fleeting touch in the form of e.g. handshakes. Feeling uneasy or trying to avoid this kind of contact may indeed have a negative effect on interpersonal communication.

The observed link between social touch and interpersonal functioning is also supported by research on development. For example, already during early infancy, social touch seems to be fundamental for the positive social development of the infant (Ardiel & Rankin, 2010; Brauer, Xiao, Poulain, Friederici, & Schirmer, 2016). By the same token, social touch reduces feelings of social exclusion (von Mohr, Kirsch, & Fotopoulou, 2017) and is crucial for social interaction (McGlone, Wessberg, & Olausson, 2014; Morrison, Löken, & Olausson, 2010) and bonding among individuals (Dunbar, 2010). Finally, it appears that touch deprivation can lead to severe social impairments (Ardiel & Rankin, 2010).

It seems therefore that the attitude towards social touch, the dislike of physical touch by people not well-known, and the level of depression are important factors for the occurrence of interpersonal problems, albeit to a different degree. On a clinical level, psychotherapists may be recommended to address the subjective attitude towards, and appreciation of, social touch in depressed patients' everyday life. This may foster the understanding of factors which affect interpersonal relationships and help to improve them.

Several factors may have limited the validity of the present study. Firstly, the sample was mostly female, thus it was not possible to determine the differences between men and women in relation to depression, interpersonal problems, attitude and appreciation of social touch. For the same reason, generalizations to the population at large must be taken carefully. Secondly, the current sample is biased due to the measurement procedure. As all of the questionnaires, except the IIP, were filled out at home by the participants, the sample only consisted of patients not only willing to participate in the research, but who were also active and motivated enough to fill out and send back the questionnaires. This may at least partly explain why the

sample consisted mostly of participants with only low to moderate levels of depression. Thirdly, as data about the clinical diagnosis of the patients were not available, we cannot be sure whether depression was really ascertained or not in these individuals. However, the fact that all the subjects were patients receiving therapy at the psychotherapy clinic provides support to the assumption that all of them presented evident psychological problems (depression and/or anxiety) requiring treatment. As we did not have access to the patients' diagnoses, we also lack information about comorbidities and the context in which the depressive symptoms were observed. Depressive symptoms occur not only in unipolar or bipolar mood disorders, but also as comorbid conditions of other mental or behavioural disorders, such as anxiety disorders (e.g., (Cloninger, 1990; Gorman, 1996)) or personality disorders (e.g., (Hirschfeld, 1999; Koenigsberg et al., 1999)). Furthermore, depressive symptomatology can be triggered by diverse events, such as hormonal changes (e.g. (Bromberger & Epperson, 2018; Brummelte & Galea, 2016)), stressful and traumatic events (e.g., (Blore, Sim, Forbes, Creamer, & Kelsall, 2015; Heim, Owens, Plotsky, & Nemeroff, 1997)), neurological conditions (e.g., (Błaszczuk & Czuczwar, 2016; Das & G, 2018)), or medication (Rogers & Pies, 2008). In all of these conditions, the causal relationships between depressive symptoms, the attitude to touch and interpersonal problems could be different. Hopefully, this study encourages further research into this topic.

Conclusion

The present study suggests that the relationship between depression and interpersonal problems is partially mediated by the attitude towards social touch and, in particular, the dislike of physical touch by people not well-known. Nevertheless, highly depressed individuals reported to enjoy touch with close ones as much as individuals with low or no depression. The current results might be of importance for expanding the knowledge about the role of social touch in the context of interpersonal communication and contributing factors to depression.

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Contributors

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, and revision of the manuscript. Specific contributions: US and IC conceived the study. US planned the study, organized data collection and acquired ethical permissions. CT analyzed the data and drafted the initial version. US and IC reviewed and revised the manuscript. All authors have approved the final manuscript

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Declaration of interest

The authors declare to have no actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within three years of the beginning of the submitted work that could inappropriately influence, or be perceived to influence, their work. APA ethical standards were followed in the conduction of the study.

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Contributors

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, and revision of the manuscript. Specific contributions: US and IC conceived the study. US planned the study, organized data collection and acquired ethical permissions. CT analyzed the data and drafted the initial version. US and IC reviewed and revised the manuscript. All authors have approved the final manuscript.

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