

## RESEARCH ARTICLE

# Touch Deprivation and Exercise during the COVID-19 Lockdown April 2020

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### Abstract

**Background:** Touch deprivation has rarely been studied except in wartime nurseries and in very few orphanages in the world. Pandemics like COVID-19 are susceptible to touch deprivation at least for those living alone and to a lesser degree for friends social distancing in public places.

**Methods:** A Survey Monkey study was conducted during April 2020. Respondents (N=260 individuals >18 years) completed several COVID-related stress scales.

**Results:** Sixty per cent of the sample reported experiencing low to high levels of touch deprivation. Correlation analyses suggested that touch deprivation was more prevalent in individuals living alone and was negatively related to health practices scale scores and positively related to scores on scales measuring COVID-related stress, negative mood states including anxiety and depression, fatigue, sleep disturbances, and posttraumatic stress symptoms. Analyses of variance revealed significant differences between touch-deprived and non-touch deprived groups on these measures. Outside exercise was studied as a potential buffer to touch deprivation inasmuch as touching and exercise have been noted to have similar effects on mood states and physical health. Correlation analyses suggested that outside exercise was positively related to health practices and negatively related to COVID-related stress, anxiety, depression, fatigue, sleep disturbances and PTSD symptoms.

**Discussion:** These data suggest the widespread prevalence of touch deprivation during COVID-19 lockdown and its relationship to negative mood states and sleep disturbances. Exercise was noted to decrease these problems as it has in previous non-COVID research.

**Conclusion:** Exercise can reduce touch deprivation related problems during pandemics like COVID-19.

**Key words:** touch deprivation, depression, sleep disturbances, exercise, COVID-19 lockdown

## **Touch Deprivation and Exercise During the COVID-19 Lockdown April 2020**

Touch deprivation has rarely been studied except in wartime nurseries and very few orphanages in the world.<sup>1</sup> Individuals who are experiencing lockdowns in pandemics like COVID-19 are susceptible to touch deprivation. Touch deprivation would be expected to be a greater problem for those living alone, and to a lesser degree for everyone due to social distancing in public places. In a study in Mexico, a pandemic was noted to negatively affect psychological well-being including increased stress levels, anxiety and depression as well as physical health, although there was no reference to touch deprivation.<sup>2</sup> Similarly, front line clinical staff in the COVID-19 pandemic in China experienced both psychological and sleep problems.<sup>3</sup> In the latter study, exercise was thought to reduce these problems.<sup>3</sup> The social distancing and the lockdown isolation associated with these pandemics may lead to touch deprivation as well as the negative effects being reported for psychological well-being and sleep.

Touch has typically been studied in the context of positive effects including decreasing stress by having couples hug each other or hold hands prior to and during stressful experimental conditions like giving a speech or solving math problems.<sup>4</sup> Anxiety and depression have been decreased and physical health has been improved by physical touch, e.g. massage therapy, in many studies.<sup>5</sup> By decreasing anxiety and depression and the associated stress hormones, e.g. cortisol, immune function can be improved. This has been illustrated in a

study showing that hugging was associated with better immune function.<sup>6</sup>

When touching has been compared to exercise, very similar positive effects have been noted. For example, when massage sessions have been compared to yoga sessions, stress has been decreased including stress hormones (cortisol), and anxiety and depression have been decreased.<sup>7</sup> That yoga and massage have similar effects is perhaps not surprising given that during both massage and yoga, pressure receptors under the skin are being stimulated. Moderate pressure stimulation, as in moving the skin, is noted to increase vagal activity which, in turn, slows heart rate and blood pressure and increases theta EEG waves (associated with relaxation) as well as decreases the production of cortisol.<sup>8</sup> Decreased cortisol, in turn, has been associated with increased natural killer cells and natural killer cell activity which reduce viral, bacterial and cancer cells.<sup>9</sup> These data highlight the potential buffering effects of exercise on touch deprivation experienced during pandemics like COVID-19.

The purpose of this research was to assess the effects of self-reported touch deprivation as well as the potential buffering effects of exercise on health activities, COVID-related stress, anxiety, depression, fatigue, sleep disturbances and PTSD symptoms in individuals experiencing the COVID-19 lockdown. Touch deprivation, as self-reported, was expected to be associated with less healthy activities, COVID-related stress, negative mood states and sleep disturbances, and exercise was expected to ameliorate those problems.

## Methods

### Participants

A G\* power analysis indicated that a sample size of 224 was required for an alpha of .05 and 80% power. The participants included individuals (N=260) who ranged in age from 18-82 years (M=47). Gender was distributed 79% female, 18% male and 3% other. Ethnicity was distributed 68% Non-Hispanic White, 21% Hispanic, 3% Black and 8% other. Professions were distributed 35% office worker, 30% academic, 15% managerial, 12% medical, and 8% labor. The average income was \$71,932 (SD=4,926), 28% were unemployed, and 69% worked at home. Twenty-three per cent lived alone.

### Procedure

A flyer was posted on Facebook giving a brief description of the study including some sample items and the age criterion being greater than 18 years. The Facebook flyer included a link to the survey on Survey Monkey which included 11 scales for a total of 87 items. The survey was four weeks duration (April 1-30, 2020), and the data were directly transported to SPSS for data analyses.

### Measures

A survey was created entitled “COVID-19 Activities Lockdown Survey”. The survey included several demographic items including those already mentioned (age, gender, ethnicity, profession, income, type of employment, working at home, and living alone). The survey included five scales created specifically for this research to relate to activities and stress associated with the

COVID-19 lockdown, and it also included two standardized measures (The PROMIS Scale<sup>10</sup> and the PTSD-8 Inventory<sup>11</sup>). The five original scales are entitled the 1) Health Scale, 2) Media/Communication Scale, 3) Connecting Subscale, 4) Working Scale, and 5) Stress Scale. The participants rated the items on the scales from zero meaning “not at all” to three meaning “a lot” including: 1) the **Health Scale** (15 items)(Cronbach’s alpha=.66) which included exercise (inside exercise, outside exercise, and outside exercise with others as well as open-ended questions asking the participant to list the types of exercise) touching (touching partner, kids and self as well as open-ended questions asking the participant to list the types of exercise), COVID-19-related safety practices including washing hands and social distancing as well as self-care, spiritual activities (meditating and feeling spiritual) and liking being at home; 2) the **Media/Communication Scale** (10 items) (Cronbach’s alpha=.58) including talking on the phone, texting, on Internet, gaming, on Facebook/Instagram, spending time receiving and sending messages/media about the virus, engaging in Zoom/Skype/Facetime activities (e.g. yoga, meditation), watching the news, watching other TV programs and watching movies; 3) the **Connecting Scale** (4 items) (Cronbach’s alpha =.41) which included connecting with friends, trying to connect with old friends, helping children do homework and receiving support from others; 4) the **Working Scale** (6 items) (Cronbach’s alpha=.61) including cooking, caregiving, housekeeping, paperwork, creative work and working on projects/hobbies; and 5) the **Stress Scale** (11

items) (Cronbach's  $\alpha = .78$ ) which included worrying about getting the virus, worrying about your financial status, wanting this experience to end, feeling isolated, feeling lonely, feeling bored, feeling touch deprived, snacking, drinking alcohol, napping, and getting "cabin fever".

The standardized scales on the survey included 4 PROMIS Subscales<sup>10</sup> (each item was rated on a 5-point scale as 1= never, 2= rarely, 3= sometimes, 4= often and 5=always) which included :1) the **PROMIS Anxiety Subscale** (4 items) (Cronbach's  $\alpha = .88$ ) including I felt fearful, I found it hard to focus on anything other than my anxiety, my worries overwhelmed me, and I felt uneasy; 2) the **PROMIS Depression Subscale** (4 items) (Cronbach's  $\alpha = .91$ ) including I felt worthless, helpless, depressed, and hopeless; 3) the **PROMIS Fatigue Subscale** (3 items) (Cronbach's  $\alpha = .92$ ) including I felt fatigued, I had trouble starting things because I'm tired, and I felt run-down; 4) the **PROMIS Sleep Disturbance Subscale** (4 items) (Cronbach's  $\alpha = .86$ ) which included my sleep quality was bad, my sleep is not refreshing, I had a problem with my sleep, and I had difficulty falling asleep.

The second standardized scale was a PTSD Screener entitled "**PTSD-8: A short PTSD Inventory**" (**PTSD-8**) (8 items) (Cronbach's  $\alpha = .92$ )<sup>11</sup> an item preceded the inventory asking if participants were reminded of a traumatic experience, and then the inventory was introduced by the statement "If you're being reminded of a traumatic experience, please rate how much the following have bothered you during the

lockdown" as: 0) not at all, 1) rarely, 2) sometimes and 3) most of the time. The items are: recurrent thoughts and memories of the event, feeling as though the event is happening again, recurrent nightmares about the event, sudden emotional or physical reactions when reminded of the event, avoiding activities that remind you of the event, avoiding thoughts or feelings associated with the event, feeling jumpy/easily startled and feeling on guard.

The last item on the COVID-19 Lockdown Activities survey was an open-ended question "Please tell us about anything you feel that has been positive about the lockdown." Survey Monkey then provided a listing of the most frequently used words and the percentiles for that item.

## Results

### Correlation Analyses Yielding Significant Coefficients for Touch Deprivation

Results indicated that 60% of the sample reported being touch deprived (0 (40%), 1 (23%), 2 (16%), 3 (22%) a lot. Correlation analyses revealed a number of significant correlation coefficients for touch deprivation (at the  $p < .05$  level with most at the  $p = .000$  level) including the demographic variable of more often "**living alone**", and the following (see table 1 for the correlation coefficients for the scales total scores): 1) for the **Health Scale** total score, and the items including less exercise with others, less touching partner, less touching your kids, less liking being home, and less self-care; 2) for items on the **Media/Communication Scale** including more texting, more Zoom, and less watching movies; 3) greater **Connecting**

with friends; 4) on the **Working Scale** for the items including less homework with kids, less cooking, housework, and paper work; 5) for the total score on the **Stress Scale** and for its items including greater worrying about the virus, wanting this experience to end, feeling isolated, lonely and bored and greater alcohol, napping, and cabin fever; 6) for the **PROMIS Anxiety Subscale** total score and all its items (feeling fearful, focus on anxiety, overwhelming worries and feeling uneasy); 7) for the total score on the **PROMIS Depression Subscale**, and all its items including feeling worthless, helpless, depressed, and hopeless; 8) for the total score on the **PROMIS Fatigue Subscale**, and all

its items including fatigue, tired, and run-down; 9) for the total score on the **PROMIS Sleep Disturbance Subscale**, and all its items including quality of sleep, refreshing sleep, problems with sleep, and falling asleep; and 10) for the total score on the **PTSD-8 Inventory** and all its items including recurrent thoughts or memories, feeling the event is happening again, recurrent nightmares, sudden emotional and physical reactions, avoiding activities that remind you of the event as well as thoughts and feelings associated with the event, feeling jumpy/easily startled and feeling on guard.

**Table 1.** Correlation coefficients for significant relationships between touch deprived ratings and scores on COVID-19 Lockdown Activities Survey scales and subscales.

<u>Measure</u>	<u>Correlation coefficient</u>	<u>p level</u>
Health Scale Score	-.28	.000
Stress Scale Score	.64	.000
PROMIS Anxiety Subscale Score	.39	.000
PROMIS Depression Subscale Score	.43	.000
PROMIS Fatigue Subscale Score	.30	.000
PROMIS Sleep Disturbance Subscale Score	.27	.000
Posttraumatic Stress Inventory Score	.35	.000

### **Correlation Analyses Yielding Significant Coefficients for Touching Your Partner/Friend**

To assess a similar measure for confirmatory data, a correlation analysis was conducted on the touching partner/friend rating. In this sample, responses to the open-ended question on the types of touching the

partner/friend included hugging (39%), hugging and kissing (21%), kissing (6%), backrubs and massage (20%), holding hands (6%), high fives (2%), sex (3%), and sleeping together (2%). The results of the correlation analysis on the touching partner/friend variable yielded the same significant correlations ( $p < .05$  with most at  $p = .000$ ) as the touch deprivation variable except in the

opposite direction. That is, positive correlations were noted between the touching partner/friend rating and the positive variables including the **Health Scale** score and items on that scale and negative correlations for the negative effects variables including total scores and items on the **Stress Scale**, the **PROMIS Depression Subscale**, the **PROMIS Anxiety Subscale**, and the **PTSD-8 Inventory**. Demographic variables including **living alone** was negatively correlated with touching partner/friend, and **younger age** was positively correlated with the touching friend/partner variable.

### Analyses of Variance (ANOVAs) on Touch Deprived Versus Non-Touch Deprived Groups

A touch deprived group (the 60% participants who reported feeling “a little to a

lot” touch deprived) was then compared to a non-touch deprived group (the 40% who reported no to the touch deprived item) via a MANOVA and ANOVAs. The MANOVA for this analysis was significant (Wilks’ Lambda  $F = 12.03$ ,  $p = .000$ ,  $\eta^2 = .36$ ). Virtually all of the variables that were significantly correlated with touch deprivation were again significant on the ANOVAs comparing the touch deprived versus non-touch deprived groups (see table 2 for the ANOVAs for the scale scores). The only exceptions were that some of the significant correlations were not replicated in the ANOVAs on the group comparisons including self-care, texting, zooming, connecting with friends and napping, and a new significant variable (“worrying about finances”) emerged in the analyses of variance.

**Table 2.** Mean scale scores for significant ANOVAs for touch deprived versus non-touch deprived groups (standard deviations in parentheses).

<u>Measure</u>	<u>Deprived</u>	<u>Non-deprived</u>	<u>F value</u>	<u>p level</u>	<u>eta<sup>2</sup></u>
Health	30.83 (5.68)	33.18 (4.88)	13.49	.002	.08
Stress	30.00 (5.66)	22.89 (4.60)	74.47	.000	.32
Anxiety	10.78 (3.42)	8.43 (3.34)	33.12	.000	.18
Depression	9.40 (4.01)	6.75 (3.26)	24.96	.000	.14
Fatigue	8.69 (3.08)	7.14 (2.93)	20.72	.000	.12
Sleep Disturbance	14.57 (4.34)	12.62 (4.65)	12.73	.001	.08
PTSD	15.96 (5.73)	12.26 (5.33)	12.76	.001	.08

### Correlation Analyses Yielding Significant Coefficients for the Exercise Variable

Results indicated that 83% of the sample reported getting outside exercise based on the ratings from 0 for none and 3 for a lot 0 (17%), 1 (26%), 2 (29%) and 3 (29%).

Responses to the open-ended question on types of outside exercise included walking/hiking (78%), running/jogging (16%), biking (10%) and gardening/yard work (12%). Correlation analyses revealed a number of significant correlation coefficients for outside exercise (at least at the  $p < .05$  level with most at the  $p = .000$  level) including the following (see table 3 for the correlation coefficients for the scale scores): 1) positive correlations with the **Health Scale** total score, and the items including more inside exercise, more outside exercise with others, more self-touch, and more self-care; 2) negative correlations with virtually every item on the **Media/Communication Scale** including less Internet, gaming, Facebook, watching TV, and watching movies, but more zooming; 3) greater **Connecting** with old friends; 3) snacking being the only significant **Stress Scale** item that was negatively correlated with exercise; 4) negative correlations with the

total **PROMIS Anxiety Subscale** score and on the items focus on anxiety and overwhelming worries; 5) negative correlations for the total score on the **PROMIS Depression Subscale** and the items feeling helpless, depressed, and hopeless; 7) negative correlations for the total score on the **PROMIS Fatigue Subscale** and the items including fatigue and tired ; 8) negative correlations for the total score on the **PROMIS Sleep Disturbance Subscale** and all the items on that scale including bad quality of sleep, non-refreshing sleep, problems with sleep, and troubles falling asleep; and 9) negative correlations for the total score on the **PTSD-8 Inventory** and 7 of the 8 items including recurrent thoughts or memories, recurrent nightmares, sudden emotional and physical reactions, avoiding activities that remind you of the event as well as thoughts and feelings associated with the event, feeling jumpy/easily startled and feeling on guard.

**Table 3.** Correlation coefficients for significant relationships between exercise ratings and COVID-19 Lockdown Survey Scale Scores.

<u>Measure</u>	<u>Coefficient</u>	<u>p level</u>
Health Scale Score	.50	.000
Stress Scale Score	-.17	.006
PROMIS Anxiety Subscale Score	-.23	.000
PROMIS Depression Subscale Score	-.23	.000
PROMIS Fatigue Subscale Score	-.23	.000
PROMIS Sleep Disturbance Subscale Score	-.23	.000
Posttraumatic Stress Inventory Score	-.19	.009

## **Analyses of Variance (ANOVAs) for the Outside Exercise Versus No-Outside Exercise Group Comparisons**

An exercise group (the 83% participants who reported a little to a lot of outside exercise) was then compared to a no-exercise group (the 17% who reported no outside exercise) via a MANOVA and ANOVAs. The MANOVA was significant (Wilks' Lambda  $F = 8.13$ ,  $p = .000$ ,  $\eta^2 = .09$ ). Several of the variables that were significantly correlated with the outside exercise variable were again significant for the ANOVAs on the outside exercise versus no-outside exercise groups. However, fewer variables differentiated the groups possibly because the groups varied significantly on the number of participants (significantly unequal  $N$ s). The significant group differences (at a  $p < .05$  with most at a  $p = .000$ ) on the exercise versus the no-exercise group comparisons included; 1) having higher scores on the **Health Scale** and its items including inside and outside exercise with someone else and self-care; 2) less gaming, TV, and movies, but more zooming on the **Media/Communication Scale**; 3) greater cabin fever on the **Stress Scale**; 4) feeling less helpless on the **PROMIS Depression Subscale** ; 5) having more refreshing sleep on the **PROMIS Sleep Disturbance Subscale** ; 6) lower scores on the **PTSD-8 Inventory** and its items memories of the event, avoiding activities associated with the event, and avoiding thoughts of the event.

## **Discussion**

Touch deprivation was negatively correlated with health activities, and the touch deprivation group differed from the

non-touch deprivation group on health activities. These were not surprising findings given that touching partners/friends and touching your kids were items on the health scale. And, when the health scale was factor analyzed as a preliminary data analysis, touching was the second most significant component next to the factor that was heavily loaded on exercise, self-care and feeling spiritual items. Providing touch stimulation has had positive effects that would be presumably opposite to the negative effects of touch deprivation. Finding support for touch deprivation and touch stimulation relationships in the literature is difficult inasmuch as touch deprivation effects have been almost exclusively studied in extreme touch deprivation situations such as Romanian orphanages, and touch stimulation effects have been researched primarily as massage therapy effects on chronic psychiatric and medical conditions.<sup>5</sup> Similarly, there is a lack of literature on relationships between touch deprivation and negative mood states including stress, anxiety, and depression, as well as fatigue, sleep disturbances, and posttraumatic stress symptoms. Thus, these findings add unique data on the psychological effects of touch deprivation on a pandemic lockdown sample.

Physical health, although not measured here, would also be compromised by touch deprivation, as it would be expected to increase stress hormones and compromise immune function. Several studies have suggested that touch (moving the skin) stimulates pressure receptors under the skin which, in turn, leads to increased vagal activity, reduced stress hormones (e.g. cortisol) and increased natural killer cells that

ward off bacterial and viral cells.<sup>5</sup>These data highlight the need for stimulating pressure receptors via moving the skin as in touching others, self-care, and exercise.

A significant literature exists for exercise-reducing effects on anxiety, depression, PTSD, and sleep disturbances in non-Covid-19 samples. For example, exercise has been noted to reduce negative emotions including anxiety and depression in a nonclinical sample<sup>12</sup>. In this study, tai chi was noted to reduce negative emotions. And in research that has explored neural mechanisms underlying exercise effects on depression, positive effects were noted for exercise.<sup>13</sup> Even a single session of moderate exercise has been noted to decrease anxiety and depression symptoms.<sup>14</sup> Further, virtual reality exercise sessions have also been effective for reducing anxiety and depression symptoms.<sup>15</sup>

In contrast, only one pilot study has been published on COVID-19 exercise effects as well as a couple commentaries on the importance of exercise during this pandemic. In one of the commentaries, the authors suggested that exercise would be especially important for older people during and after the Covid-19 pandemic because of their limited physical activity associated with social distancing and staying at home.<sup>16</sup> In another commentary, the authors suggested that moderate intensity aerobic exercise would be an effective therapy in preventing and controlling the COVID-19 pandemic, although no empirical data were given.<sup>17</sup> The only empirical data published on exercise effects during COVID-19 involved exercise for “frontline clinical staff in the fight against

the pandemic in China”.<sup>3</sup> In this small sample study, clinical staff at one hospital received exercise while those in another hospital did not. However, this was not a randomized, controlled trial, and the exercise data were not presented. Nonetheless, their observations are suggestive that exercise can reduce psychological and sleep problems during pandemics.

Other negative effects that emerged in this study were sleep disturbances and PTSD symptoms. In a recent review called “Moving to beat anxiety: Epidemiology and therapeutic issues with physical activity for anxiety”, PTSD symptoms were reduced secondary to exercise.<sup>18</sup> And, in a recent systematic review and meta-analysis, exercise was noted to improve sleep quality, as it had been reported in many earlier systematic and meta-analysis reviews.<sup>19</sup>

The potential underlying effects of touch stimulation and exercise have been thought to be similar. In research comparing massage therapy and yoga, for example, similar effects have been noted, suggesting that moving the skin increases vagal activity which in turn slows the nervous system (e.g. decreases heart rate and increases EEG theta waves associated with relaxation).<sup>5,9</sup> The slowing of the nervous system is associated with reduced anxiety, depression, and stress hormones (e.g. cortisol) that in turn enhances immune function (e.g. increases natural killer cells and natural killer cell activity that kill bacterial and viral cells). Future studies that measure the hormonal and immune effects of pandemic lockdown touch deprivation and exercise could inform prevention/intervention research. Thus, in

the context of the literature on non-COVID samples, the results of this COVID-19 Lockdown Activities Survey are not surprising. Unfortunately, living alone was related to touch deprivation including not touching friends, and living alone has been correlated with these negative experiences in other data analyses on this COVID-19 survey sample.<sup>20</sup> Fortunately, 83% of the sample participants were engaging in outside exercise which was related to less negative effects of stress, anxiety, depression, sleep disturbances, and PTSD symptoms.

It should be noted that these data have methodological limitations including that they are self-report data with their frequently noted bias and memory effects. In addition, they are derived from a non-representative sample of predominantly non-Hispanic white females. Although this respondent sample is reputedly representative of Survey Monkey

samples, the data would not be generalizable to the larger population. Further, causality or the direction of effects cannot be determined from cross-sectional data. Nonetheless, these data are suggestive that exercise may ameliorate some of the negative effects of touch deprivation during pandemics like COVID-19.

### **Conclusion**

Touch deprivation is a widespread COVID-19 lockdown experience. Its relationship to health problems, negative mood states, sleep disturbances and posttraumatic stress symptoms highlights the need for decreasing touch deprivation. Exercise, which is similar to touch stimulation in terms of its effects and underlying mechanisms, reduced the problems related to touch deprivation in this COVID-19 lockdown sample.

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