

## Research Article

# Exercise Improves Psychological and Physical Well-Being during a COVID-19 Lockdown

Tiffany Field<sup>1,2\*</sup>, Samantha Poling<sup>2</sup>, Shantay Mines<sup>2</sup>, Debra Bendell<sup>2</sup>, Connie Veazey<sup>2</sup>

<sup>1</sup>Touch Research Institute, University of Miami/Miller School of Medicine, USA

<sup>2</sup>Fielding Graduate University, California, USA

\***Corresponding author:** Tiffany Field, Professor, Touch Research Institute, University of Miami School of Medicine, Florida, USA

**Citation:** Field T, Poling S, Mines S, Bendell D, Veazey C (2020) Exercise Improves Psychological and Physical Well-Being during a COVID-19 Lockdown. J Community Med Public Health 4: 196. DOI: 10.29011/2577-2228.100096

**Received Date:** November 03, 2020; **Accepted Date:** November 09, 2020; **Published Date:** November 16, 2020

### Abstract

Indoor exercise, outdoor exercise, and outdoor exercise with others have had buffering effects on psychological problems during the COVID-19 lockdown. In this Survey Monkey study conducted during a COVID-19 lockdown (N=260 respondents), the most prevalent forms of indoor exercise were yoga and stretching while the most frequent forms of outdoor exercise were walking and running. Correlation analyses suggested that indoor, outdoor, and outdoor exercise with someone else were positively related to scores on the Health Scale and negatively related to scores on the Anxiety, Depression, Fatigue, Sleep Disturbance, and PTSD scales. In addition, indoor exercise and outdoor exercise with someone else were positively correlated with scores on the Connecting and Working Scales. The results of these data analyses are limited by the self-reported data from a non-representative, cross-sectional sample. Nonetheless, they highlight the positive effects of exercise during a COVID-19 lockdown.

**Keywords:** COVID-19; Exercise; Psychological

### Introduction

COVID-19 lockdowns have negatively affected the psychological and physical well-being of individuals in several parts of the world. Exercise has improved psychological and physical well-being in studies prior to COVID-19. However, unfortunately, exercise has decreased for individuals surveyed during lockdowns and could have, in turn, contributed to their lesser well-being. The few COVID-19 exercise studies in the literature to date have focused on the prevalence or change in exercise without exploring its effects on well-being. The purpose of the current study was to explore the relationships between exercise and psychological and physical well-being.

In the COVID-19 lockdown literature, several psychological and physical problems have been noted including anxiety, depression, sleep disturbances, and PTSD symptoms [1-6]. For example, in a lockdown sample from China, 35% experienced anxiety, 20% depression, and 8% sleep disturbances [1]. And in another sample from China, similar levels were reported at 29% for anxiety and 17% for depression [2]. In a sample from Italy, prevalence data were notably similar including 33% for anxiety and 24% for depression, although sleep disturbances were more prevalent in this sample at 52% [3]. And, in another sample from Europe (Austria), 19% were experiencing anxiety, 21% depression,

and 16% insomnia [4]. Further, sleep problems were related to PTSD symptoms in a sample from China [5], which were, in turn, as prevalent as 30% in an Italian sample [6].

Although exercise has rarely been studied in COVID samples, it has alleviated psychological and physical problems in many pre-COVID studies. Recent examples from the extensive pre-COVID literature on the therapeutic effects of exercise include the reduction of anxiety, depression, sleep problems, and PTSD symptoms [7-13]. Exercise has reduced anxiety [7,8], depression [9,10], and comorbid anxiety and depression [11]. In addition, the reduction in depression has been associated with a thickening of the anterior cingulate that is typically “thinned” by depression [10]. Further, exercise has reduced sleep problems [12] and PTSD symptoms [13]. And, exercise has, not surprisingly, enhanced immune function including reducing inflammation and increasing natural killer cells [14-16].

Unfortunately, although exercise would be expected to reduce these psychological and physical problem during lockdowns just as they have in pre-COVID 19 samples, low levels of exercise have been reported by most researchers who have studied exercise during lockdowns [17-19]. For example, in a study on a lockdown sample in China, participants were given the International Physical Activities Questionnaire, and 40% of the sample had less physical activity while 70% had greater screen time as compared to their pre-COVID activities [17]. In another lockdown sample, both

activity and energy expenditure levels during the COVID-19 lockdown were half their pre-COVID-19 levels [18]. And, in still another study, physical activity was reduced for 42% of the sample and remained the same for 31% of the sample, although activity increased for 27% of the sample [19].

Only a couple studies could be found in the COVID-19 literature that explored the relationship between exercise and psychological problems [19,20]. In one study, an inverse relationship was noted between exercise and anxiety [20]. In the second study, both outdoor and indoor exercise were associated with lower levels of anxiety. For outdoor exercise, 54% of individuals had good mental health versus 41% who did not engage in outdoor exercise. For indoor exercise, 69% had good mental health versus 62% who did not exercise indoors. The differential effects of exercise on anxiety appeared to be greater for outdoor exercise (a 13% greater decrease for those exercising than those who did not) than for indoor exercise (a 7% greater decrease for those who did versus those who did not exercise). And, the greater percent of individuals benefiting from indoor exercise suggests that more individuals were exercising indoors versus outdoors (69% vs. 54%), which would not be surprising for a lockdown sample.

The purpose of the data analyses for this paper was to determine the relationships between three forms of exercise including indoor, outdoor, and outdoor exercise with someone else and psychological and physical variables including health behaviors, communication, work activities, stress, anxiety, depression, fatigue, sleep disturbances and PTSD symptoms. Based on the pre-COVID-19 exercise literature and the couple COVID-19 exercise-mental health relationship studies just reviewed, all three forms of exercise were expected to be related to better psychological and physical well-being.

## 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 ( $M=47$  years). Gender was distributed 79% female, 18% male and 3% other (non-specified). Ethnicity was distributed 68% Non-Hispanic White, 21% Hispanic, 3% Black and 8% other (non-specified). Professions were distributed 35% office worker, 30% academic, 15% managerial, 12% medical and 8% labor. The average income was \$72,572, 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

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 following five scales were created specifically for this survey to relate to activities and stress associated with the COVID-19 lockdown [21]. The participants rated the items on the scales from zero meaning “not at all” to three meaning “a lot” including the:

- 1) **Health Scale** (15 items) (Cronbach’s  $\alpha=.66$ ) which included exercise (inside exercise, outside exercise and outside exercise with others as well as the types of exercise), touching (touching partner, kids and self as well as the types of touching), COVID- 19-related safety practices including washing hands and social distancing, self-care, spiritual activities (meditating and feeling spiritual), and liking being at home. A factor analysis yielded three factors contributing to 47 % of the variance on the Health Scale score: Factor 1 “Self/Spiritual Care” that included meditating (.74), self-care (.68), and feeling spiritual (.77) items that together explained 23% of the variance; Factor 2 “Touching” that included the items touching your kids (.75) and touching your partner or friend (.72) that together explained 14% of the variance; and Factor 3 “Exercise” that included the items outside exercise (-.89) and exercise outside with someone else (-.76) that together explained 10% of the variance.
- 2) **Media/Communications 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. A factor analysis yielded four factors contributing to 61 % of the variance on the Media/Communication Scale score: Factor 1 “Entertainment” that included the items watching movies (.84) and TV programs (.80) that together explained 23 % of the variance; Factor 2 “Communication” that included phone use (.80), texting (.70) and Zoom (.63) that together explained 14% of the variance; Factor 3 “Social Media” that included being on the internet (.78) and Facebook time (.60) that together explained 13% of the variance; and Factor 4 “COVID-19 News” that included watching the news (.79) and messaging about the virus (.60) that together explained 11% of the variance.
- 3) **Connecting Scale** (4 items) (Cronbach’s  $\alpha=.41$ ) that included connecting with friends, trying to connect with old friends, helping children do homework, and receiving support from others.
- 4) **Working Scale** (6 items) (Cronbach’s  $\alpha=.61$ ) including

cooking, caregiving, housekeeping, paperwork, creative work, and working on projects/hobbies; and

- 5) **Stress Scale** (11 items) (Cronbach’s alpha=.78) which included worrying about getting a 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”. A factor analysis yielded three factors contributing to 56 % of the variance on the Stress Scale score: Factor 1 “Stimulation deprivation” that included the items feeling Isolated (.86), feeling lonely (.86), feeling bored (.74), getting cabin fever (.70), and feeling touch deprived (.65) that together explained 34% of the variance; Factor 2 “Worrying” that included the items worried about finances (.67) and worried about the virus (.47) that together explained 12% of the variance; and Factor 3 “Stress behaviors” that included the items napping (.68) and snacking (.53) that together explained 10% of the variance.

The standardized scales on the survey included 4 PROMIS Subscales [22] (each item was rated on a 5-point scale as 1= never, 2= rarely, 3= sometimes, 4= often, and 5=always) which included the: 1) **PROMIS Anxiety Subscale** (4 items) (Cronbach’s alpha=.88) which included I felt fearful, I found it hard to focus on anything other than my anxiety, my worries overwhelmed me, and I felt uneasy;

2) **PROMIS Depression Subscale** (4 items) (Cronbach’s alpha=.91) including I felt worthless, helpless, depressed, and hopeless;

3) **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; and

4) **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**” (8 items) (Cronbach’s alpha=.92) [23]. This inventory is 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.

**Results**

**Correlation Analyses Yielding Significant Coefficients for Indoor Exercise**

Results indicated that 72% of the sample reported indoor

exercise (rated 0 (28%) not at all, 1 (33%), 2 (20%), 3 (19%) a lot). The most frequent forms of indoor exercise were yoga (24%) and stretching (14%).The correlation analyses revealed significant correlations (at least at the p<.05 level or greater) between indoor exercise and gender and routine indicating that females and those with a routine engaged in more indoor exercise. Significant correlation coefficients were noted for the following scales and items on scales (see Table 1 for the correlation coefficients for the scales’ total scores): 1) a positive correlation for the **Health Scale** total score and for its items indicating more outdoor exercise, outdoor exercise with someone else, touching self, meditating, self-care, and feeling spiritual; 2) a positive correlation with the total score on the **Connecting Scale** and its items connecting with friends, trying to connect with old friends, and feeling support; 3) a positive correlation with the **Working Scale** total score and its items including more cooking and housekeeping; 4) negative correlations with **Stress Scale** items indicating feeling less isolated, lonely, and bored and less snacking; 5) negative correlations with the total **PROMIS Anxiety Scale** score and its items suggesting less overwhelming worries and less feeling uneasy; 6) negative correlations with the total **PROMIS Depression Scale** score and its items indicating feeling less helpless and hopeless; 7) negative correlations with the total **PROMIS Fatigue Scale** score and its items suggesting less fatigue and less trouble starting things because of being tired; 8) negative correlations with the **PROMIS Sleep Disturbance Subscale** score and its sleep quality item indicating better quality sleep; and 9) negative correlations with the **PTSD-8 Inventory** total score and its items suggesting fewer recurrent nightmares about the event, less avoiding thoughts and feelings associated with the event, feeling less jumpy/easily startled, and feeling less on guard.

Measure	Correlation coefficient	p level
Health Scale Score	0.54	0.001
Connecting Scale Score	0.24	0.001
Working Scale Score	0.13	0.05
PROMIS Anxiety Subscale Score	-0.14	0.05
PROMIS Depression Subscale Score	-0.16	0.01
PROMIS Fatigue Subscale Score	-0.25	0.001
PROMIS Sleep Disturbance Subscale Score	-0.12	0.05
PTSD-8 Inventory Score	-0.19	0.01

**Table 1:** Correlation coefficients for significant relationships between indoor exercise and scores on COVID-19 Lockdown Activities Survey scales and subscales.

**Correlation Analyses Yielding Significant Coefficients for Outdoor Exercise**

Results indicated that 72% of the sample reported outdoor exercise (rated 0 (28%) not at all, 1 (17%), 2 (26%), 3 (29%) a lot). The most frequent forms of outdoor exercise were walking (69%)

and running (13 %). Correlation analyses revealed a number of significant correlation coefficients for outdoor exercise (at least at the  $p < .05$  level) and demographic variables suggesting that those who had more outdoor exercise were older, more often female, had more schooling, and had a routine. Significant correlations between outdoor exercise and scales and scale items included the following (see Table 2 for the correlation coefficients for the scales' total scores): 1) a positive correlation for the **Health Scale** total score and its items including more indoor exercise, more outdoor exercise with someone else, more self-touching (e.g. brushing in shower, yoga, and stretching) and more self-care; 2) a negative correlation on **Media/Communication Scale** items indicating less internet use, gaming, Facebook time, time on zoom and watching tv and movies; 3) a positive correlation with the **Connecting Scale** item suggesting more time trying to connect with old friends; 4) a negative correlation suggesting less snacking on the **Stress Scale**; 5) negative correlations with the **PROMIS Anxiety Scale** total score and its items suggesting less finding it hard to focus on anything other than anxiety and less overwhelming worries; 6) negative correlations with the **PROMIS Depression Subscale** total score and all its items including feeling less worthless, helpless, depressed, and hopeless; 7) negative correlations for the **PROMIS Fatigue Subscale** total score and all its items indicating feeling less fatigue, tired, and rundown; 8) negative correlations for the **PROMIS Sleep Disturbance Subscale** total score and all its items including having better sleep quality and refreshing sleep, and having less sleep problems, and difficulty falling asleep; and 9) negative correlations for the **PTSD-8 Inventory** total and 6 of its 8 items including having less recurrent thoughts or memories of the event, less recurrent nightmares about the event, less avoiding activities that remind you of the event, less avoiding thoughts or feelings associated with the event, feeling less jumpy/easily started and less feeling on guard.

Measure	Correlation coefficient	p level
Health Scale Score	0.52	0.001
PROMIS Anxiety Subscale Score	-0.18	0.005
PROMIS Depression Subscale Score	-0.23	0.001
PROMIS Fatigue Subscale Score	-0.24	0.001
PROMIS Sleep Disturbance Subscale Score	-0.21	0.001
PTSD-8 Inventory Score	-0.22	0.005

**Table 2:** Correlation coefficients for significant relationships between outdoor exercise and scores on COVID-19 Lockdown Activities Survey scales and subscales.

### Correlation Analyses Yielding Significant Coefficients for Outdoor Exercise with Someone Else

Results indicated that 54% of the sample reported outdoor exercise with someone else (rated 0 (46%) none, 1 (23%), 2 (18%), 3 (13%) a lot). Correlation analyses revealed significant correlations between outdoor exercise and more schooling, less living alone, and having more kids living with you and several scale scores and their items (at least at the  $p < .05$  level) (see Table 3 for the correlation coefficients for the scales' total scores): including; 1) a positive correlation for the **Health Scale** total score and its items indicating more indoor and outdoor exercise, more touching your kids and your partner, more self-touch, more washing hands, and feeling more spiritual; 2) positive correlations on the **Media/Communication Scale** items suggesting more phoning, more texting, and more time on zoom; 3) positive correlations with the **Connecting Scale** total score and its items suggesting more time trying to connect with old friends and helping children with homework; 4) positive correlations with the **Working Scale** total score and its items indicating more cooking, caregiving, housekeeping, paper work, and creative work; 5) a negative correlation with the **Stress Scale** item suggesting feeling less touch deprived; 6) negative correlations with the **PROMIS Depression Subscale** total score and its items including feeling less worthless, depressed, and hopeless; 7) negative correlations for the **PROMIS Fatigue Subscale** total score and its items indicating less fatigue and being tired; and 8) a negative correlation for the **PTSD-8** total score and its item less feeling on guard.

Measure	Correlation coefficient	p level
Health Scale Score	0.58	0.001
Connecting Scale Score	0.25	0.001
Working Scale Score	0.27	0.001
PROMIS Depression Subscale Score	-0.19	0.005
PROMIS Fatigue Subscale Score	-0.13	0.05
PTSD-8 Inventory Score	-0.15	0.05

**Table 3:** Correlation coefficients for significant relationships between outdoor exercise with others and scores on COVID-19 Lockdown Activities Survey scales and subscales.

### Discussion

All three forms of exercise were associated with higher health behavior scores and lower depression, fatigue and PTSD scores which is consistent with the pre-COVID literature [7-13]. These findings add to the COVID-19 literature that has so far only

associated exercise with reduced anxiety [19,20]. In the current database, an inverse relationship was noted between anxiety and both indoor and outdoor exercise but not for outdoor exercise with others. Those exercising with others may have had lower baseline anxiety scores that did not change with exercise.

Indoor and outdoor exercise were also associated with lower sleep disturbance scores, again consistent with pre-COVID literature [12]. But that relationship was not noted for outdoor exercise with others. Those exercising with others may have had lower baseline sleep disturbance scores because they engaged in more touching their partners and their kids. The facilitating effects of touching on sleep have been noted in the pre-COVID literature [24].

Indoor exercise and outdoor exercise with others were also positively related to the scores on the connecting with others and working on projects scales. These other indoor activities may have confounded and compounded the exercise effects as they would also be expected to contribute to psychological and physical well-being.

Outdoor and indoor exercise have been compared by others in a pre-COVID sample [25]. Those authors noted that outdoor exercise had greater effects on mental and physical health. Both their indoor and outdoor exercise protocols involved walking and running. Their findings may be consistent with the data from the current survey inasmuch as the correlation coefficients for outdoor exercise and mental and physical health variables were greater than those for indoor exercise or outdoor exercise with others in this lockdown sample. The outdoor exercise may have been more rigorous as it was most frequently walking and running as opposed to the indoor exercise that was most frequently yoga and stretching. This would be expected to have a greater effect on depression via the higher serotonin levels that have been associated with more rigorous exercise like running [26]. However, as already noted, inside exercise and outside exercise with others were also associated with other healthy indoor activities including connecting with others, working on projects and feeling more spiritual. Further, outdoor exercise with others was significantly associated with less living alone, living with more kids, and more touching partners and kids which would be health enhancing.

These cross-sectional data are limited by not having baseline data on the exercise or the physical and mental health variables to assess change on any of the variables. Not anticipating the timing of lockdowns has limited most of the exercise, physical and mental health studies in the COVID-19 literature. The current sample was also limited by its being primarily Non-Hispanic white females, although it was representative of different age groups. Females engaged in more indoor exercise (yoga and stretching) which was not surprising, but female participants also engaged in more outdoor exercise (walking and running), as did older individuals

which were surprising findings. These were not significant effects for outside exercise with someone else.

Other problems with this survey included the self-report data that was dependent on recall but also subject to social desirability bias, although the anonymity of the data would enhance its veridicality. Further, the geographic location of participants was unknown, so that between subjects variability would be expected on the degree of lockdown isolation and constraints on outdoor exercise during the month of the survey. Despite these methodological limitations, these survey data highlight the importance of these types of exercise for psychological and physical well-being.

## References

1. Huang Y, Zhao N (2020) Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. *Psychiatry Res* 288: 112954.
2. Wang C, Pan R, Wan X, Tan Y, Xu L, et al. (2020) A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. *Brain Behav Immun* 87: 40-48.
3. Altena E, Baglioni C, Espie CA, Ellis J, Gavriloff D, et al. (2020) Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. *J Sleep Res*. e13052.
4. Li J, Yang Z, Qiu H, Wang Y, Jian L, et al. (2020) Anxiety and depression among general population in China at the peak of the COVID-19 epidemic. *World Psychiatry* 19: 249-250.
5. Liu N, Zhang F, Wei C, Jia Y, Shang Z, et al. (2020) Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. *Psychiatry Res* 287: 112921.
6. Forte G, Faviori F, Tambelli R, Casagrande M (2020) COVID-19 pandemic in the Italian population: Validation of a post-traumatic stress disorder questionnaire and prevalence of PTSD symptomatology. *Int J Environ Res Public Health* 17: 4151.
7. Stubbs B, Vancampfort D, Rosenbaum S, Firth J, Cosco T, et al. (2017) An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. *Psychiatry Res* 249: 102-108.
8. Mc Dowell CP, Carlin A, Capranica L, Dillon C, Harrington JM, et al. (2020) Associations of Self-Reported Physical Activity and Anxiety Symptoms and Status among 7,874 Irish Adults across Harmonised Datasets: a DEDIPAC-Study. *BMC Public Health* 20: 1-11.
9. Kandola A, Ashdown-Franks G, Hendrikse J, Sabiston CM, Stubbs B (2019) Physical activity and depression: Towards understanding the antidepressant mechanisms of physical activity. *Neurosci Biobehav Rev* 107: 525-539.
10. Gujral S, Aizenstein H, Reynolds III CF, Butters MA, Grove G, et al. (2019) Exercise for Depression: A Feasibility Trial Exploring Neural Mechanisms. *Am J Geriatr Psychiatry* 27: 611-616.
11. Ströhle A (2009) Physical activity, exercise, depression and anxiety disorders. *J Neural Transm (Vienna)* 116: 777-784.
12. Banno M, Harada Y, Taniguchi M, Tobita R, Tsujimoto H, et al. (2018) Exercise can improve sleep quality: a systematic review and meta-analysis. *PeerJ* 6: 5172.

13. Kandola A, Vancampfort D, Herring M, Rebar A, Hallgren M, et al. (2018) Moving to the anxiety: epidemiology and therapeutic issues with physical activity for anxiety. *Curr Psychiatry Rep* 20: 63.
14. Simpson RJ, Katsanis E (2020) The immunological case for staying active during the COVID-19 pandemic. *Brain Behav Immun* 87: 6-7.
15. Neiman DC, Wentz LM (2019) The compelling link between physical activity and the body's defense system. *J Sport Health Sci* 8: 201-217.
16. Zbinden-Foncea H, Francaux M, Deldicque L, Hawley JA (2020) Does high cardiorespiratory fitness confer some protection against pro-inflammatory responses after infection by SARS-CoV-2? *Obesity (Silver Spring)* 28: 1378-1381.
17. Hu Z, Lin X, Kaminga AC, Xu H (2020) Impact of the COVID-19 epidemic on lifestyle behaviors and their association with subjective well-being among the general population in mainland China: cross-sectional study. *J Med Internet Res* 22: e21176.
18. Srivastav AK, Sharma N, Samuel AJ (2020) Impact of Coronavirus disease-19 (COVID-19) lockdown on physical activity and energy expenditure among physiotherapy professionals and students using web-based open E-survey sent through WhatsApp, Facebook and Instagram messengers. *Clin Epidemiol Glob Health*.
19. Lopez-Bueno R, Calatayud J, Ezzatvar Y, Casajus JA, Smith L, et al. (2020) Association Between Current Physical Activity and Current Perceived Anxiety and Mood in the Initial Phase of COVID-19 Confinement. *Front Psychiatry* 11: 729.
20. Colley RC, Bushnik T, Langlois K (2020) Exercise and screen time during the COVID-19 pandemic. *Health Rep* 31: 3-11.
21. Field T, Mines S, Poling S, Bendell D, Veazey C (2020) Young, living alone and young living alone negatively affects mood states and sleep during a COVID-19 lockdown 2020. *Mental Health and Clinical Psychology* 4: 31-38.
22. Dewitt B, Feeny D, Fischhoff B, Celia D, Hays RD, et al. (2018) Estimation of a preference-based summary score for the patient reported outcomes measurement information system: The PROMIS-preference (PROPr) scoring system. *Medical Decision Making* 38: 683-698.
23. Hansen M, Anderson TE, Armour C, Elklit A, Palic S, et al. (2010) PTSD-8: A short PTSD inventory. *Clin Pract Epidemiol Ment Health* 6: 101-108.
24. Field T (2019) Social Touch, CT Touch and Massage Therapy. *Developmental Review* 51: 123-145.
25. Coon JT, Boddy K, Stein K, Whear R, Barton J, et al. (2011) Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A systematic review. *Environ Sci Technol* 45: 1761-1772.
26. Lee JB, Lee HJ, Lee SJ (2019) Blood dopamine level enhanced by caffeine in men after treadmill running. *Chin J Physiol* 62: 279-284.