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Original Research

Factors Influencing Motivation to Perform Mental and Physical Tasks During the Initial Lockdown Period of the COVID-19

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ABSTRACT

International Journal of Exercise Science 15(5): 1600-1615, 2022. Drastic changes to lifestyles have occurred during the COVID-19 pandemic. An unintended consequence of stay at home orders is increased isolation and less social interaction for many people. For overall wellbeing it is important to stay both physically and mentally active; however, for many individual's motivation may be a barrier. There are non-modifiable (e.g. sex, age, personality, infection rates in the area) and modifiable factors (e.g. physical activity, diet, sleep) that may be associated with motivation to perform physical and mental tasks. We collected data from 794 subjects using an online survey between April 13th to May 3rd of 2020. Survey questionnaires included demographics, personality traits, diet, sleep, physical activity levels, mental workload and motivation to perform mental and physical tasks. Multiple linear regression analyses were used to assess the association between non-modifiable and modifiable variables on motivation to perform mental and physical tasks. The results of our analyses suggest that those who reported a higher quality of diet (REAP-S score), exercised vigorously, and reduced their sedentary time, reported higher motivation to perform both mental and physical tasks. Those who were employed and had higher grit were more motivated to perform physical tasks. Lower trait physical energy was associated with greater motivation to perform mental tasks. Our findings support that during challenging times, such as the COVID-19 pandemic, it is important for healthcare practitioners to emphasize the importance healthy lifestyle behaviors to prevent individuals from experiencing a lack of motivation to perform both mental and physical tasks. Future research should focus on trying to determine the directionality of the relationship between specific healthy lifestyle behaviors and motivation.

KEY WORDS: Physical activity, diet, sleep, grit, energy, fatigue

INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) deemed the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) a pandemic due to the alarming spread among nations and world-wide transmission (66). In an effort to mitigate the spread of the virus there were nationwide shut downs in the United States however, the measures implemented varied from state to state. These efforts to mitigate the spread by implementing physical distancing policies although effective in controlling the spread of the virus (30), led to unintended mental and physical health issues (29). While many studies have examined the mental and physical health effects of the pandemic (2, 27), along with changes in lifestyle behaviors (37, 42, 44), there is limited evidence regarding motivation to perform mental and physical tasks during this pandemic (55). Most research in the field of motivation focuses on intrinsic (17, 26) and extrinsic motivation (26, 29) and the role these two types of motivation play in our lives. However, during a stressful time, such as the COVID-19 pandemic, demographic and lifestyle factors likely influence motivation to perform mental and physical tasks (e.g. are people who lead healthier lifestyles more likely to be motivated to continue to be physically and/or mentally active).

Literature on demographics and how they may influence our motivation to perform mental and physical tasks is limited. There is literature that suggests that men tend to be more physically active than women (44, 45). Women tend to be more motivated to engage in exercise for the social aspect and, for the stress relief and weight management (34,36). Whereas, men are more motivated to enjoy exercise and become physically strong (36). While these studies examined the different reasons for being motivated to exercise, there is a paucity of literature as to whether men or women are overall more motivated to be physically active. In regards to sex differences in motivation to perform mental tasks there does not appear to be any published literature on the topic.

Many studies have examined how the type of motivation to be physically active changes with age (23, 35, 57), with several studies finding an association between age and motivation to be physically active (13, 23). Shaw and Sokane reported that age related declines in physical activity are noted in individuals with less education as is unemployment (60). However, highly-educated individuals report less of a decline in physical activity with age, and an increase in physical activity when they are unemployed (60). Not unexpectedly, developing chronic health problems (e.g. having chronic diseases) is associated with lower levels of physical activity (60). Interestingly, when it comes to motivation to perform mental tasks, older workers tend to be less motivated to do job related mental tasks (28). Additionally, educated individuals tend to work in fields which are reliant on mental work (e.g. white-collar jobs). To our knowledge there is no literature that reports an association between education levels and motivation to perform mental work.

Another factor known to influence motivation to perform mental and/or physical tasks is grit. Grit has been previously defined as sustained effort and desire for achieving long-term goals as well as being able to overcome adversity encountered during the process (21). Duckworth and colleagues (20, 24) found that gritty individuals tend to be more likely to engage in behaviors that lead to accomplishing long-term goals. Singh (61) deduced that an employee's consistency of interest (an aspect of grit) in their work, was associated with intrinsic motivation to excel in demanding situations. While these findings are based in school and workplace contexts, a recent study by Totosy de Zepetnek and colleagues (65) found that gritty individuals are also more likely to participate in healthy behaviors such as increased physical activity and consuminge higher quality diets. It must be noted that these studies did not explicitly examine the relationship between motivation and grit; however, it may be inferred that gritty individuals are more motivated to perform mental and physical tasks that may be associated with greater success in school and workplace.

Several studies, where short one-time interventions were given, suggest that higher fatigue is associated with decreased motivation to perform mental (7,8) and physical (12, 40) tasks. Although these studies have focused on fatigue and motivation in an acute setting it may be hypothesized that long-standing feelings of fatigue (i.e. trait fatigue) may be associated with decreased motivation to perform mental and physical tasks. Trait fatigue is a fairly new construct with existing literature suggesting that trait fatigue should not be examined as a lack of energy (11, 36). Instead trait fatigue and energy should be examined on a separate unipolar continuum. Additionally, evidence presented by Boolani and colleagues (10, 25, 38) suggests that mental and physical aspects of trait energy and fatigue should be examined as four separate continuums. There seems to be a bi-directional relationship between motivation to perform physical activity and physical activity performed. For example, an increase in motivation can lead to an increase in physical activity (6) or an increase in physical activity may lead to an increase in motivation as self-efficacy increases (22, 39).

Other lifestyle behaviors, such as dietary behaviors and sleep, appear likely to influence one's motivation to perform mental and physical tasks. In acute settings foods high in polyphenol (i.e fruits and vegetables) or other phytochemical rich foods (i.e. brightly colored fruits and vegetables, fruits, grains) have been associated with increased motivation to perform mental tasks (44,45) suggesting that higher quality dietary intake may be associated with increased motivation to perform mental tasks. Evidence suggests that poor sleep can lead to decreased motivation and increased burnout (15,36,57). Several authors have reported the prevalence of poor sleep quality (49, 52) and feelings of burnout (32, 47) during the COVID-19 pandemic. Some of these findings even suggest that poor sleep can negate the positive benefits of exercise (50) and diet (15) on fatigue, a mood known to negatively influence motivation.

Therefore, the purpose of this study was to determine the association between fixed demographic factors (e.g. age, sex, education level), traits (e.g. grit, trait mental and physical energy and fatigue) and health associated lifestyle behaviors (e.g. physical activity, diet, sleep) on motivation to perform mental and physical tasks in adults in the United States during the lockdown phase of the COVID-19 pandemic. We hypothesize that older, well-educated, gritty, employed individuals who lead a healthy lifestyle will be more motivated to perform mental and physical tasks.

METHODS

Participants

Data for this study were obtained as part of a larger, ongoing study investigating the impact of the COVID-19 pandemic on lifestyles and moods throughout the pandemic in the United States. The target population were males and female aged 18 or older living in the United States. Participants were recruited using a snowball method, via social media (Twitter, Facebook), emails to friends and colleagues of the PIs, media publications and promotions of the two institutions (Clarkson University and George Mason University), and via word-of mouth. Social media followers, friends and colleagues were encouraged to share the survey. Informed consent was obtained in the cover letter of the survey explaining the study and asking the participant to click on "I agree" to acknowledge that they understand the description provided, as such consent to participating in this research study. The study procedures were approved by the Institutional Review Boards (IRB) at Clarkson University (approval #20.5.1) and George Mason University (#1592393-1).

Protocol

The methods that the authors conducted followed all guidelines stated in the IJES Ethical Policies (52). The survey was collected on an online platform (Qualtrics, XM, Provo, UT) and was accessible on any device with an internet connection. Components of the survey included: demographics, Trait and State Mental and Physical Energy and Fatigue, Grit Scale Short Form (Grit-S), Rapid Eating Assessment for Participants Short Form (REAP-S), Pittsburgh Sleep Quality Inventory (PSQI), International Physical Activity Questionnaire Short Form (IPAQ-SF), Mental Workload, and the Motivation to Perform Mental and Physical Tasks. All participants completed the survey once between April 13th and May 6th, 2020.

Demographics: Inquired about age, sex, highest level of education, living arrangements (i.e., do you have children living at home, etc.), employment status, smoking status, and chronic medical conditions. Additionally, participants reported whether they or someone they know had been diagnosed with COVID-19. A dichotomous variable was created for employment status (employed=currently working full- or part-time).

Trait and State Mental and Physical Energy and Fatigue: The trait aspect scale has a 12-item measure with 3 items per trait. This measures the typical mental and physical energy and fatigue moods prior to physical and mental activities. Statements include "I usually feel energetic" and "I usually feel exhausted" followed by a 5 point scale from "never" to "always" (54). Cronbach's alpha ranges from 0.73 to 0.93, among healthy adults. The state aspect scale uses the same 12-items, the difference being how the scale was measured (9). Trait scale measured from 0 - 12, while State scale measured from 0-10 (9,54).

Grit-S: Grit-S is the shorter version of Grit questionnaire developed by Duckworth and Quinn. The short form consists of eight items and is measured by perseverance and passion (22). Participants answered on a 5-point Likert Scale of 1 = Not at all like me to 5 = Very much like me. Representative statements include "I am diligent" and "I finish whatever I begin". The total combined points were added up and divided by 8 to achieve the grit score: the lowest score is 1 (not gritty at all) and the maximum score is 5 (extremely gritty). The Grit-S has been shown to have a Cronbach's alpha range of 0.73 to 0.83 (22).

REAP-S: The survey requests the participants to report their dietary intake and behaviors during the past 30 days. Thirteen items assessed frequency of food choices with three responses: Rarely/Never (1), Sometimes (2), and Usually/Often (3). After individually assessing all the questions and adding the scores together, the participants scoring a higher total REAP-S score, consumes a healthier diet (33). Red ~~F~~flags are determined with any items scoring a (1) Rarely/Never (58). The dietary behaviors questioned involved breakfast skipping, frequency of home cooked meals vs. restaurant food, and the willingness to make their diets healthier. Cronbach's alpha was 0.86 (58).

PSQI: Regarding the past month, seven components are questioned in this survey: sleep medication, sleep quality, sleep efficiency, daytime dysfunction due to sleepiness, sleep latency, sleep disturbance, and sleep duration (14). Overall scoring is between 0 and 21, 0 equating to best sleep and 21 as the worst sleep. According to the instructions by the PSQI form, a score > 5 is defined as poor sleep. Cronbach's alpha has been shown to be 0.68 to 0.78 for overall PSQI (14).

IPAQ-SF: As a seven-item scale, participants self-report their physical intensity, duration, and frequency of physical activity. Participants are also asked about time spent sitting performed over the last seven days. Time spent sitting included sitting at a desk, visiting friends, reading, traveling or watching television. Number of minutes of vigorous (e.g. heavy lifting, digging, aerobics, fast cycling), moderate (e.g. carrying light loads, bicycling, doubles tennis) and light activity (e.g. walking for travel or leisure) per week were reported and calculated. Craig and colleagues (19) categorized activity as inactive (0 minutes), insufficiently active (0 to < 150 minutes), sufficiently active (150 to < 300 minutes) and highly active (> 300 minutes). Total time spent sitting was reported in number of hours and categorized as 0 to < 4 hours, 4 to < 6 hours, 6 to < 8 hours, and > 8 hours (19). The short form IPAQ Cronbach's Alpha was calculated to be 0.60 (19).

Mental Workload: Six total questions are asked to gauge participants' mental workload during typical work and non-work days. Examples of mental work provided on the survey were reading, learning, organizing and analyzing information or solving problems. Four items report numerical values: frequency of days working (attending school/working), hours per day they typically work, hours per day during the week doing mental work, and hours per day during non-work/school days doing mental work (5). The final two items refer to an intensity scale; 1 = very low intensity, 2 = low intensity, 3 = average, 4 = intense, and 5 = very high intensity. Items consist of the average intensity of mental work on work/school days and average intensity on non-work/school days (5).

Self-reported Motivation To Perform Mental and Physical Tasks: Participants were questioned about their degree of motivation to perform mental and physical tasks over the past week. Participants were directed to scale the tasks from 0 (No motivation) to 100 (Highest motivation imaginable). Motivation to perform physical and mental tasks results were used as dependent variables in this study (44).

Local 7-day infection rates: Using geo-tracking data and data collected from the Johns Hopkins University COVID-19 tracking website, we collected local infection rates (per million) for the past 7 days prior to the day that participants took the survey.

Statistical Analysis

All data was downloaded from Qualtrics and transferred to Microsoft Excel, where it was scored. Data was then uploaded to SPSS v26.0, where data was evaluated for normality of distribution using a combination of histograms and the Shapiro-Wilks test for normality. If there were any missing data points for outcome variables of concern, the participant's entire data were removed from the analyses. Only motivation to perform mental and physical tasks were normally distributed while all other variables were not normally distributed ($p < 0.05$); exponential, power, arcsine and logarithmic transformation techniques were used, however none of the transformations resulted in normally distributed data. Grit and REAP-S scores had histograms looked normally distributed, while physical activity scores had bimodal distributions. Sitting time was negatively skewed. Therefore, large sample theory was employed to use parametric tests (17,38). To limit the effects of potential outliers, respondents who reported scores > 3 standard deviations (SD) on either side of the mean for any of the variables of interest in this study were eliminated.

Descriptive statistics were computed for demographics, as well as for physical activity, sedentary and dietary behaviors. Two multiple regression analyses were used to find the associations between our independent variables (infection rates, demographics, trait moods, grit, lifestyle behaviors) and the two dependent variables (motivation to perform mental and physical tasks). For all models the variance inflation factor was below 2.5. A post-hoc power analysis was calculated using G*Power (version 3.1.9.2). All analyses were completed using SPSS v26.0 (IBM Corp. Released 2016, IBM SPSS Statistics for Windows: Armonk, NY) and a significance level of $p < 0.05$ was used.

RESULTS

A total of 1557 subjects started the survey with 1154 participants completed at least 80% of the survey (74.0%). After omitting participants who were not in the United States ($n = 166$), those who had not completed the variables of interest ($n = 96$) and outliers ($n = 98$), a sample of 794 participants were analyzed for this study. The average age of our respondents was 34.71 ± 14.00 yrs, with 74% of our sample reported being female. There were no significant differences in demographic variables (sex, $p = 0.882$; age, $p = 0.472$; education, $p = 0.563$) between the included participants and those omitted from the main analyses. Demographic information of included participants can be found in Table 1.

Table 1. Participant demographics (*n* = 794)

Variable	Mean	Standard Deviation
Motivation for Mental Tasks	49.59	24.91
Motivation for Physical Tasks	49.06	25.79
7-day infection rate (per 1 million)	75.53	178.01
Age (yrs)	34.71	14.00
Sex		
Male	26.6%	
Female	73.3%	
Transgender	0.10%	
Education:		
Some high school	0.20%	
High school diploma/GED	2.4%	
Education beyond high school	13.0%	
Associates degree	6.0%	
Bachelor's degree	37.9%	
Master's degree	27.2%	
Doctorate degree	13.3%	
Children living at home		
Yes	27.4%	.
No	72.6%	
Living situation		
Big city	14.6%	
Small city	20.6%	
Suburb	21.6%	
Small town	25.4%	
Rural area	17.9%	
Current employment status (during COVID-19 pandemic):[a]		
Employed full-time	50.6%	
Furloughed/laid off	3.4%	
Employed part-time	7.1%	
Self-employed	2.8%	
Full-time student	18.7%	
Part-time student	0.70%	
Unemployed	11.8%	
Retired	4.8%	
Chronic medical condition		
Yes	31.5%	
No	68.5%	
Smoker		
Yes	7.0%	
No	93.0%	
Vigorous physical activity (minutes/week)	248.23	442.34
Moderate physical activity (minutes/week)	240.84	495.48

Light physical activity (minutes/week)	377.00	603.06
Total time spent sitting (minutes/week)	2848.88	1361.72
Intensity of mental workload on work/school days	91.97	86.03
Intensity of mental work on non-work/school days	22.48	40.93
Number of hours of work/week	32.19	21.00

Results from the regression models explained 6.8% of variance ($R^2 = .094$, $F(24, 814)=3.529$, $p < .001$) in motivation to perform mental tasks over the last 7 days. Higher trait physical energy and more time spent sitting were associated with lower levels to perform mental tasks, while engaging in vigorous physical activity, better quality diets and self-reported intensity of mental workload on both work and non-work days were associated with an increase in motivation to perform mental tasks. Results can be found in Table 2.

Our models explained 20.5% of variance ($R^2 = .228$, $F(24, 814) = 9.989$, $p < .001$) in motivation to perform physical tasks. Vigorous physical activity, light physical activity, grit and higher diet quality were positively associated with motivation to perform physical tasks, while total time spent sitting and being unemployed was negatively associated with motivation to perform physical tasks.

Table 2. Multiple linear regression models of motivation to perform mental and physical tasks

	Mental Motivation				**Physical Motivation**			
Variable	***B***	***T-statistic***	***p-value***	***95% CI***	***B***	***T-statistic***	***p-value***	***95% CI***
7-day Average Infection Rate	-.003	-.087	.930	-.010, .009	-.006	-.195	.845	-.010, .008
Age (years)	.009	.223	.823	-.123, .154	-.048	-1.331	.184	-.222, .043
Sex (Ref: Male)	.033	.951	.342	-2.017, 5.806	.026	.804	.422	-2.204, -.681
Education status (Ref: Less educated)	.032	.886	.376	-.762, 2.015	.032	.953	.341	-.681, 1.967
Children at home (Ref: Yes)	.023	.605	.545	-2.844, 5.381	.006	.161	.872	-3.559, 4.241
Employment status (Ref: Employed)	-.018	-.517	.606	-3.199, 1.866	-.064	-2.025	**.043***	-4.907, -0.76
Chronic medical conditions (Ref: Yes)	.010	.267	.790	-3.361, 4.418	.005	.159	.874	-3.410, 4.012
Do you smoke? (Ref: Yes)	-.009	-.264	.792	-8.037, 6.133	-.043	-1.353	.177	-11.417, 2.101
Grit	.003	.067	.947	-2.966, 3.175	-.073	-2.052	**.041***	-5.991, -.133
Intensity of mental work on work/school days	.171	4.839	**.000*****	.030, .071	-.010	-.320	.749	-.023, .016

Intensity of mental work on non-school/work days	.106	3.017	**.003****	.021, .099	.021	.636	.525	-.025, .049
Chronic medical conditions (Ref: Yes)	.010	.267	.790	-3.361, 4.418	.005	.159	.874	-3.410, 4.012
Trait Physical Energy	-.108	-2.209	**.027***	-2.235, -.132	-.049	-1.090	.276	-1.560, .446
Trait Physical Fatigue	-.002	-.029	.977	-1.119, 1.086	-.055	-1.123	.262	-1.653, .450
Trait Mental Energy	.086	1.777	.076†	-.097, 1.945	.039	0.868	.385	-.543, 1.405
Trait Mental Fatigue	-.022	-.406	.685	-1.268, 0.834	-.028	-.568	.570	-1.293, .713
Vigorous Physical Activity	.113	2.820	**.005****	.002, .010	.266	7.200	**.000*****	.010, .018
Moderate Physical Activity	-.009	-.216	.829	-.004, .003	.001	.022	.982	-.003, .003
Light Physical Activity	-.036	-1.011	.313	-.004, .001	.088	2.678	**.008****	.001, .006
Total time spent sitting (minutes/week)	-.148	-4.197	**.000****	-.003, -.001	-.228	-7.010	**.000*****	-.005, -.003
REAP-S score	.085	2.441	**.015***	.104, .954	.175	5.453	**.000*****	.722, 1.533
PSQI component 2: Sleep latency	-.024	-.653	.514	-2.310, 1.156	-.020	-.584	.559	-2.145, 1.161
PSQI component 3: Sleep duration	-.034	-.972	.331	-3.645, 1.231	-.011	-.353	.724	-2.743, 1.908
PSQI component 5: Sleep disturbances	.030	.815	.415	-2.056, 4.979	.003	.096	.923	-3.191, 3.520
PSQI component 6: Use of sleep medication	.027	.767	.443	-1.034, 2.360	-.029	-.868	.385	-3.556, 1.374
PSQI component 7: Daytime dysfunction	-.033	-.800	.424	-3.636, 1.531	-.033	-.869	.385	-3.556, 1.374
R^2	0.094				0.228			
Adjusted R^2	0.068				0.205			
F	3.529				9.989			
p-value	<0.001				<0.001			

Notes: Predictor values are standardized beta; †, $p < 0.1$; *, $p < 0.05$; ** $p < 0.01$; *** < 0.001.
Abbreviations: PSQI, Pittsburgh Sleep Quality Index; REAP-S, Rapid Eating Assessment for Participants Short Form.

DISCUSSION

The purpose of this study was to identify the association between non-modifiable factors (demographics), transiently fixed personality traits (trait moods, grit) and modifiable lifestyle behaviors (physical activity, diet, sleep) and with motivation to perform mental and physical tasks. We found that only lifestyle behaviors influence motivation to perform both mental and physical tasks. The results of our analysis suggest that those who reported engaging in more vigorous physical activity, a higher quality of diet (REAP-S score) and reduced their sedentary time, reported higher motivation to perform both mental and physical tasks. We found a positive association between mental workload and motivation to perform mental tasks. In regards to transiently fixed factors, trait physical energy was negatively associated with motivation to perform mental tasks while grit was positively associated motivation to perform physical tasks. Overall, the findings from our study suggest that leading a healthy lifestyle is associated with motivation to perform mental and physical tasks.

While previous literature has reported on the types of motivation that are associated with sex, our study finds that there are no sex differences in the level of motivation to perform mental or physical tasks. Additionally, while previous literature suggests that motivation to perform mental and physical tasks decreases with age (13, 23, 35, 56, 57), our findings report no such association. Our findings also contradict a previous study which have reported an association between education levels and motivation to be physically active (60).

Our hypothesis was partially correct in that we find that gritty individuals are more motivated to perform physical tasks. Previous findings (30, 60) report that gritty individuals were more likely to be physically active, which may be due to the fact that they were more motivated to be physically active. Our findings suggest that this may be the case, as grit was positively associated with motivation to perform physical tasks. However, our findings did not find any significant association between grit and motivation to perform mental tasks. These findings were unexpected as we know that gritty individuals are usually more motivated to perform well in work and school (24, 58). Our results may be due to participants misunderstanding of the question or maybe gritty individuals are not more motivated to perform mental work and are instead more consistent with the amount of work they perform to reach their long-term goals. Ultimately, as our study took place during the COVID-19 pandemic numerous factors may have altered the relationship between grit and the motivation to perform mental tasks.

Interestingly, our study finds that sitting time was negatively associated with both the motivation to perform mental and physical tasks. While these findings are not directional, based on previous findings on the detrimental effects of sedentary behavior on mental and physical health (1, 15, 19, 21) we may hypothesize that being sedentary reduces the motivation to perform mental and/or physical tasks. Additionally, based on previous findings on acute dietary interventions, we find that higher quality diets were positively associated with both motivation to perform mental and physical tasks (44,45). Once again, while not directional, we can assume that individuals who eat a healthy diet are also more likely to be more motivated to be mentally and physically active. In line with previous studies, we find that the motivation to perform physical tasks is associated with performing vigorous physical activity. While this association has proven to be bi-directional in the past (5, 22), due to the design of our study we could not provide a direction either. However, it must be noted that being motivated to perform physical tasks was associated with high intensity and light physical activity and not with moderate activity. This suggests that motivation to perform physical tasks translates to increased levels of physical activity on both ends of the intensity spectrum but not the middle.

Another interesting finding in our study is that we find that those who performed more mental work on non-work days also reported greater motivation to perform mental tasks. One explanation for this might be the work by Bennett and colleagues (4) who report that workers feel more motivated to work and less fatigued when they perform work related mental tasks on days that they are not working. Although our study design was unable to elucidate the directionality of the relationship, based on the work by Bennett and colleagues (4) we may hypothesize that bringing work home might make one more motivated to perform mental work.

A quizzical finding in our study is the negative association between trait physical energy and motivation to perform mental work. Based on previous literature we cannot explain these findings however, one potential explanation for this might be that those who are high trait physical energy also tend to be more physically active (10), and may prefer to be more physically active than to engage in tasks requiring mental work. Additionally, as the pandemic forced many individuals to increase time spent on computers to perform mental work this may have been demotivating for those with high trait physical energy. This would be an area to further explore in future research.

The findings from our study imply that leading a healthy lifestyle is most associated with being motivated to be mentally and physically active. Although our study design did not provide the directionality between the relationship, we suggest that individuals who would like to feel more motivated to perform mental work reduce their sitting time, eat a high-quality diet and perform mental work on non-work days. Additionally, if individuals lack motivation to perform physical activity, reducing sitting time, eating a higher quality diet and performing vigorous physical activity may help increase motivation to perform physical activity. We recommend that during this pandemic as work environments are shifting, people may use periodic walking breaks between bouts of sedentary time (59), use a standing desk (64) and participating in more vigorous physical activity (22, 33). Additionally, people should consume healthier foods, such as eating more fruits (47), vegetables (47), and eat less fatty and processed (2) foods.

As with any study there several limitations, including the cross-sectional nature of this study design and as a result we report associations and not causal relationships. Another potential limitation of this study is the fact that data was collected through snowball sampling through the researchers' online networks. This may bias the type of population that responded to the survey in regards to factors (e.g. age, education level, socioeconomic level) related to internet access and/or use. Additionally, as with any self-reported study, there may be inherent bias in the reporting of survey data.

The objective of this study was to examine the association between demographic factors, long-standing pre-disposition (trait) energy and fatigue, grit and healthy lifestyle behavior. In our participants the findings suggest that leading a healthy lifestyle is most associated with motivation to perform mental and physical tasks. These findings suggest that individuals focus on adopting healthy lifestyle behaviors in order to feel more motivated to perform mental and/or physical tasks. Future research should focus on trying to determine the directionality of the relationship between healthy lifestyle factors and motivation as well as analyzing the lifestyle behaviors prior to the COVID-19 restrictions.

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