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Self-Reported and Behavioral Perseverance Associated with the Maintenance of Health Behaviors

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ABSTRACT

Self-Reported and Behavioral Perseverance Associated with the Maintenance of Health Behaviors

Alivia Frazier

Research has shown that positive psychological traits, such as perseverance, may be associated with the maintenance of health behaviors aimed to prevent commonly fatal diseases (e.g., cardiovascular disease, stroke). Although there is limited research in this area, the current study examined whether there was an association between self-reported perseverance, behavioral perseverance, and distress tolerance with various health behaviors (e.g., sleep, physical activity, nutrition, vaping, alcohol use, general health status, and COVID-19 behaviors). A novel methodology was implemented for this study that employed using the online mirror tracing task as a measure of behavioral perseverance.

A sample of young adult participants (N=763) enrolled in undergraduate courses at West Virginia University completed the perseverance of effort subscale from the Grit Scale, the Distress Tolerance Scale (DTS), Pandemic Stress Index, Pittsburgh Sleep Quality Index (PSQI), and various items from the Behavioral Risk Factor Surveillance System (BRFSS) using an online survey system. A subset of this sample (N = 48) volunteered to participate in the second portion of this study in which they completed the online mirror tracing task and pre- and post- measures of the Positive and Negative Affect Schedule (PANAS). Multiple, ordinal, and logistic analyses were independently conducted with self-reported perseverance, behavioral perseverance, and distress tolerance as the predictor variables and health behaviors, positive and negative affect reactivity, and COVID-19 impact as the criterion variables. Mediational analyses were conducted to examine the effect of perceived importance and difficulty of maintaining health behaviors as potential mediators for any significant associations between measures of perseverance and measures of engagement in various health behaviors.

Multiple regression analysis showed that distress tolerance significantly predicted global PSQI scores, such that participants with higher distress tolerance scores reported engaging in better sleep. In addition, distress tolerance predicted general health status and COVID-19 impact in ordinal regression analyses. The variables of self-reported perseverance and behavioral perseverance did not significantly predict any health behaviors. Each health behavior that was significantly predicted by distress tolerance (e.g., sleep quality and general health status) were examined in mediational models. One mediation model revealed significant indirect effects in that perception of difficulty in maintaining healthy sleep behaviors partially explained the association between distress tolerance and sleep quality. No other indirect effects were observed. This study highlighted the potential importance of distress tolerance as a relevant factor in explaining whether young adults engage in some important health behaviors and suggest that future research is warranted in using this measure to explore questions of interest to health psychologists.
Self-Reported and Behavioral Perseverance Associated with the Maintenance of Health Behaviors

The study of adherence to engaging in healthy lifestyle behaviors along with the examination of barriers and motivation for engaging in them is critical to the field of health psychology. Although much research has focused on negative emotional states (e.g., depression, anxiety) that interfere with maintenance of health behaviors (e.g., Ramsawh et al., 2009; Sathyanarayana Rao et al., 2008; Sokolovsky et al., 2021), research has recently focused on the importance of how positive psychological traits may be related to an individual’s engagement in a healthy lifestyle. The impact of this field of inquiry is vitally important because the diseases that kill hundreds of thousands of Americans each year, like cardiovascular disease and stroke, are largely preventable with adherence to modifiable health behaviors (Murphy et al., 2021). Not smoking, engaging in regular physical activity, managing stress, and eating a low-fat and low-sodium diet among other health behaviors can greatly reduce the risk of heart disease and stroke (e.g., Mayo Clinic Staff, 2022).

In addition to health behaviors, psychological traits may also be associated with the likelihood that an individual will develop cardiovascular disease or stroke. For example, a meta-analysis found significant associations between anger and hostility with coronary heart disease (CHD) in both healthy and coronary heart disease patient populations (Chida & Steptoe, 2009). Depression has also been found to be significantly correlated with cardiovascular disease and stroke in prospective studies. Approximately one in five patients who experience coronary heart disease and heart failure is depressed, and almost one in three patients is depressed after surviving a stroke (Cohen et al., 2015). Despite the considerable number of studies examining negative psychological traits (e.g., anxiety, depression, anger) associated with behavioral health
risks and the engagement in healthy lifestyles, there are only a few studies that have examined how positive psychological traits may be associated with an increased risk of cardiovascular disease and other major health concerns and adherence to health behaviors that prevent their onset (e.g., Aspinwall & Tedeschi, 2010; Vázquez et al., 2009). One positive psychological trait that has been examined in association with a few health behaviors is perseverance.

**Operationalization and Measurement of Perseverance**

Perseverance is not only an important topic to understand motivation for academic and work success, but also for maintaining physical and mental health (Ginty et al., 2015; Waters et al., 2018). Peterson and Seligman (2004) define perseverance as “Finishing what one has started, keeping on despite obstacles… Not as flashy a strength as bravery, persistence nonetheless shares with it the mustering of will to perform in the face of contrary impulses” (p. 202). It is important to note that the terms “perseverance” and “persistence” are often used interchangeably throughout the literature. For purposes of this study, the continued effort in spite of obstacles or challenges will be referred to as perseverance.

Many researchers have studied perseverance using self-report measures, such as the Grit Scale and the Short Grit Scale (Grit-S) (Duckworth et al., 2007; Duckworth & Quinn, 2009) and pursuit of educational goals. Items from the perseverance of effort subscale on the Grit Scale include “I am diligent. I never give up” and “Setbacks don’t discourage me. I don’t give up easily.” The construct of grit, defined as displaying persistence and passion for pursuing one's goals, partially consists of items reflecting perseverance. For example, one study measured perseverance with the Grit Scale and found that there was no significant association between trait-like perseverance, or grit, and college students’ academic achievement (Bazelais et al., 2016). However, another study used the Short Grit Scale to measure perseverance and found a
significant association between the belief in free will and stronger perseverance and long-term academic goals among Chinese adolescents (Li et al., 2018). Self-report measures of perseverance have also been used to examine associations related to physical health outcomes. For example, when examining self-reported variables associated with physical activity, researchers found that grit significantly predicted the participants’ transtheoretical stage of change for high and moderate intensity exercise (Reed et al., 2013).

It is less common for researchers to study perseverance with behavioral measures, such as duration of engagement in completing either Euler puzzles or the Paced Auditory Serial Addition Task (PASAT) (Bibbey, 2014; Gronwall, 1977). One study of Australian football players did not find a significant association between self-reported mental toughness and behavioral perseverance which was defined by their performance on a 20 m shuttle run test following a series of physical fitness tasks (Gucciardi et al., 2016). A dissertation study using psychotherapy dropout as a behavioral measure of persistence found that clients reporting higher levels of distress were associated with an increased likelihood of treatment dropout (Yu, 2011). Some studies examining cardiovascular reactions to acute stress presentations have also use behavioral measures of perseverance by assessing number of attempts at solving impossible puzzles or endurance in completing a cold pressor challenge (i.e., submersion of one's arm in ice water; Chauntry et al., 2019). In these studies, increased task perseverance was associated with greater blood pressure reactions although it is unknown what the ideal blood pressure is for these tasks (i.e., not exaggerated or blunted). In sum, perseverance can be measured using both self-report questionnaires and observation of one's behavior while performing a task and it could be argued that using both methods of assessment would be optimal in assessing this positive psychological construct.
Studies Examining Perseverance and Health Behaviors

Numerous health behaviors are known to reduce vulnerability to a range of life-threatening medical consequences later in life, including: engagement in regular physical activity, getting adequate sleep, not smoking tobacco, limiting consumption of alcohol, eating a healthy diet, and during the current COVID-19 pandemic, engaging in health behaviors that are known to reduce viral transmissions (e.g., mask wearing). Although logical to hypothesize that perseverance may be associated with regular engagement in these health behaviors, very few studies have examined these relations. After all, engagement in any of them only once or twice will do very little to prevent negative health consequences.

Most of the evidence comprising the literature examining the association between perseverance and engagement in health behaviors explores the association between perseverance, or grit, and physical activity. As noted above, Reed et al. (2013) measured perseverance using the Short Grit Scale to assess if grit would predict the transtheoretical model stage of change for high and moderate intensity exercise. Grit was found to significantly predict the stage of change, in that higher grit scores were associated with more advanced stages of change (e.g., action; maintenance). However, the sole use of self-reported data for assessing both perseverance and exercise is a limitation for this study’s findings. In another study by Reed (2014), a hierarchical regression analysis was used to find that self-reported grit, conscientiousness, and industriousness were positively associated with self-reported exercise behavior, but only grit significantly predicted exercise scores. One study used the two subscales of the Grit Scale (i.e., consistency of interests and perseverance of efforts) to measure grit for predicting physical activity objectively measured using a research-grade accelerometer (e.g., Actigraph GT3X) for seven consecutive days (Hein et al., 2019). This study found that students’ consistency of interest
on the Grit Scale was positively correlated with physical activity. Contradictory to the researchers’ hypothesis, the perseverance of effort score from the Grit Scale was not found to be significantly related to physical activity. In sum, a few studies have supported the finding that self-reported grit was associated with physical activity, but there were no studies found using a behavioral measure of perseverance to examine this association.

A few studies examining smoking and drinking behaviors used the self-reported data of a construct similar to perseverance, distress tolerance. Distress tolerance is defined as the ability to continuously pursue a goal despite facing affective discomfort due to perceived distress (Brown et al., 2005). This construct is similar to perseverance, in that people who tolerate distress better typically persist at tasks longer. In a study using the PASAT as a measure of distress tolerance, heavy episodic drinking adolescents showed poorer distress tolerance to the PASAT during a period of early abstinence as compared to demographically matched nondrinking teens (Winward et al., 2014). In a systematic review of distress tolerance and smoking, findings suggested that level of distress tolerance can, under certain circumstances, predict smoking cessation lapse (Veilleux, 2019).

Regarding other health behaviors, there are few existing publications on sleep and perseverance (e.g., Ehrampoush et al., 2019; Park et al., 2019), and little to no studies examining associations for perseverance with nutrition or COVID-19 health behaviors (e.g., Totosy de Zepetnek et al., 2021). One research study examined the associations between grit, sleep quality, and grade point average (GPA) using the Grit Scale and the Pittsburgh Sleep Quality Index (PSQI). Their findings showed that grit was a significant predictor of GPA but not sleep quality scores from the PSQI. However, grit was shown to be a mediating factor of the association between sleep quality and academic performance (Siah et al., 2018). Although there are few
studies examining perseverance and health behaviors, the majority of findings show that significant relations between these constructs existed and further research was required to support these claims.

**Purpose of Study and Hypotheses**

The purpose of the current study was to examine relations between all the aforementioned health behaviors and self-reported and behavioral perseverance using a novel methodology - the mirror tracing persistence task. This task, which involves tracing a shape while viewing its inverse image shown on a mirror, has been used previously in experimental studies examining cardiovascular reactivity to stress (e.g., Davig et al., 2000; Feldman et al., 2014), albeit none involving the measurement of perseverance. Although the PASAT has been used in previous studies examining perseverance, it is highly correlated with math ability and measures of intelligence and is known to be associated with strong practice effects (e.g., Tombaugh, 2005). The mirror-tracing task, in contrast, is a novel task that few people have experienced and is not confounded by participant intelligence or math capability. Due to the ongoing COVID-19 pandemic, an online version of the mirror tracing task was used in the current study. Similar to measures of behavioral perseverance used in previous studies, task duration was used as a measure of behavioral perseverance in addition to two self-reported measures of perseverance to predict health behavior engagement: participants’ scores on the Grit Scale perseverance subscale and the Distress Tolerance Scale.

The primary purpose of this research was to examine whether self-reported and behavioral perseverance, as measured by duration of time on the mirror tracing task, predicted self-reported health behaviors. Based on previous research, it was hypothesized that self-reported and behavioral perseverance would significantly predict engagement in physical activity,
smoking cigarettes, drinking alcohol, and overall general health. Although there is a lack of evidence for the association of perseverance with sleep, nutrition, and COVID-19 health behaviors, it was predicted that these variables would be predicted by perseverance as well.

A secondary hypothesis in this study was to examine factors through which perseverance influenced engagement in health behaviors. Based on previous studies, fatigue has been shown to be associated with task effort and performance (e.g., Wright, 2014). According to Wright, fatigue has complex effects on task effort. Fatigue can increase, decrease, or have no influence on task effort, depending upon the difficulty of the task and the degree of importance placed upon task completion by the individual engaged in it. Based on Wright's conceptualization, significant relations between measures of perseverance and health behaviors were further examined employing both perceived difficulty and importance of each health behavior as mediating factors of the perseverance and health behavior association. It was hypothesized that for any health behaviors that were significantly predicted by self-reported or behavioral perseverance, perceived difficulty and/or importance may explain this association.

Mood or affect is also known to impact engagement in health behaviors (e.g., AlAmmar et al., 2020; Consedine & Moskowitz, 2007) and could explain associations between perseverance and engagement in health behaviors. In the current study, measures of affective reactivity to the behavioral perseverance task were assessed via the Positive and Negative Affect Schedule (PANAS); positive and negative affectivity were examined for any health behavior associated with the behavioral perseverance measure. Based on previous literature, it was hypothesized that affect reactivity would mediate any significant relations observed between behavioral perseverance and engagement in health behaviors. Because measures of affective reactivity were specifically assessed during the mirror-tracing task, this hypothesis was only be
conducted on associations between the measure of behavioral perseverance and health behavior and not the self-reported measures of grit or distress tolerance.

There is a lack of research literature examining behavioral measures of perseverance and their association with health behaviors, in contrast to studies measuring self-report of grit. Further research is needed to support the hypothesis that behavioral perseverance predicts engagement in a variety of health behaviors. In summary, the current study aimed to (a) use the online mirror tracing task as a novel measure of behavioral perseverance; (b) examine the relations between distress tolerance, self-reported perseverance, and behavioral perseverance in predicting engagement in important health behaviors; and (c) assess how affect reactivity, perceived task difficulty, and perceived task importance mediated the associations between perseverance and health behaviors.

Methods

Participants

A total of 763 participants attending West Virginia University aged 16 to 64 years old completed the self-reported online questionnaires via SONA Systems. This research was primarily advertised to undergraduate students taking introduction to psychology and abnormal psychology courses, but was available to all WVU undergraduate students. This sample included 632 females, 122 males, four non-binary/gender queer individuals, two transgender individuals, and three participants that declined to answer the question on gender. Regarding race, there were 663 white, 20 Asian, 29 Black or African American, and 28 mixed race individuals in this dataset. Another 15 participants identified as another race (e.g., Filipino, Japanese, American Indian or Alaska Native) or declined to answer the question on race.

Of these 763 participants, 322 expressed an interest in completing the online research
session following the survey, and although all were invited to do so, only 49 participants signed up for and completed the second portion of this study. The final sample used for this research included 48 participants aged 18 to 34 years old, with a mean age of 20 years of age. Of note, one participant was removed for declining to answer the majority of the questions on SONA. There were 40 female, six male, and two non-binary/gender queer individuals comprising the final study sample. The racial composition of the final study sample included 39 white, one Black or African American, two Asian, four mixed race, and two “other race” individuals. The mean level of education for these participants was between one and two years of college, with a range existing from a high school education to four or more years of college. On the family economic status ladder (e.g., with 1 being the lowest rung and 10 being the highest rung), the mean score that participants chose was 6.02 with a standard deviation of 1.55 and a range of 3 to 10.

Sample size for this study was determined using G*Power. An a priori analysis was performed to determine that a minimum of 45 participants was needed for a linear multiple regression test with a Cohen’s $\text{f}^2$ effect size of 0.3, an $\alpha$ level set at 0.05, and power set at 0.8. The power analysis demonstrated that this study had an adequate sample size for regression analyses including three predictor variables, as well as mediational models including two predictor variables. There were no exclusion criteria used during the recruitment process of this study. After the SONA survey, all participants who completed the surveys were invited to participate in the online Zoom™ session of the experiment.

**Design**

This was a quasi-experimental study that examined the association between self-reported and behavioral indicators of perseverance in response to a mental task and engagement in several
self-reported health behaviors. Self-reported measures included a subscale of the Grit Scale that taps into the construct of trait perseverance and the Distress Tolerance Scale, a measure associated with perseverance in enduring stress. A behavioral measure of perseverance was determined based upon duration of active task engagement to the stress task that was employed. Multiple regression analyses (and logistic and ordinal logistic regression analyses where appropriate) were conducted.

**Self-Report Measures**

**Demographics.** The participants’ demographic information was collected using the online screener which included: sex, race/ethnicity, age, and GPA (see Appendix A). Participants were also asked in the screener about their current health behaviors, as well as self-reported grit and distress tolerance.

**Grit Scale.** The Grit Scale (Duckworth et al., 2007; see Appendix B) was included in the online screener as a primary measure of trait perseverance using the perseverance of effort subscale scores. Grit is a positive psychological trait that is defined as an individual having perseverance and passion for long-term goals (Duckworth et al., 2007). The Grit Scale includes 12 items which are rated on a 5-point Likert-type scale from “Not like me at all” to “Very much like me.” Many studies were conducted during the initial development of the Grit Scale to examine its psychometric properties and its association with other variables (e.g., Duckworth et al., 2007). Duckworth et al. (2007) conducted an exploratory factor analysis that revealed two factors among the pool of items during development of this instrument: perseverance of effort and consistency of interests. The two factors were correlated at $r = .45$. The fully developed Grit Scale demonstrated a high internal consistency for its overall scale ($\alpha = .85$) and for each factor. Cronbach’s alpha was .84 for consistency of interests and was .78 for perseverance of effort.
Duckworth et al. (2007), the Grit Scale demonstrated incremental predictive validity for level of education over and beyond Big Five Conscientiousness and other Big Five personality traits, and for number of lifetime career changes over and beyond age, Big Five Conscientiousness, and other Big Five personality traits (Duckworth et al., 2007).

Although grit is not the same construct as perseverance, the perseverance of effort subscale represents a fair measure of trait perseverance used in the current study. In a study by Duckworth et al. (2007), the Grit Scale was found to predict summer training retention of West Point cadets over and above conscientiousness and their Whole Candidate scores. The United States Military Academy West Point creates Whole Candidate scores for applicants that incorporates their academic performance (e.g., ACT or SAT scores, GPA), leadership (e.g., extracurricular activities, community service), and physical fitness (e.g., performance on the physical aptitude test) (Maddi et al., 2012). Alternative instruments that solely measure perseverance were considered less applicable for the proposed study sample and setting. For example, the Persistence Life-Skills Self-Efficacy Scale (Kossek et al., 2003) was designed for measuring goal attainment and job search knowledge, and the Measure of Adolescent Well-Being – Perseverance Scale (Kern et al., 2016) was designed for use with adolescents. The Short Grit Scale (Duckworth & Quinn, 2009) was also considered, but the psychometric characteristics of the shortened measure are much weaker than the original Grit Scale (Gonzalez et al., 2019).

Distress Tolerance Scale. The Distress Tolerance Scale (Simons & Gaher, 2005; see Appendix C) total scores were also included in the screener as a primary measure of distress tolerance. The Distress Tolerance Scale includes 15 items which are rated on a five-point Likert-type scale from “Strongly disagree” to “Strongly agree.” For example, items on this measure include “Feeling distressed or upset is unbearable to me” and “I’ll do anything to avoid feeling
distressed or upset.” Items on this scale were intended to reflect either the ability to tolerate emotional distress, subjective appraisal of distress, attention being absorbed by negative emotions, or regulation efforts to alleviate distress (Simons & Gaher, 2005). Cronbach’s alpha for the single-factor scale was .89 and the Distress Tolerance Scale showed good convergent and discriminant validity as evidenced by its negative associations with measures of affective distress ($r = -.59$) and its positive associations with measures of positive affectivity ($r = .26$). A confirmatory factor analysis was conducted that yielded a single factor solution and test-retest reliability over a period of 6 months was good (intraclass $r = .61$; Simons & Gaher, 2005).

**Positive and Negative Affect Schedule (PANAS).** The PANAS (Watson et al., 1988; see Appendix D) was administered before and after task administration. The PANAS is a 20-item scale with two factors containing 10 items each with scores on each factor ranging from 10 to 50. Positive affect is one factor within the scale that is intended to reflect the extent to which an individual felt enthusiastic, active, and alert. The second factor is negative affect which is intended to reflect subjective distress including states of low mood such as anger, contempt, disgust, guilt, fear, and nervousness (Watson et al., 1988). Each of these subscales were examined in separate analyses for this study. This scale includes a 5-point Likert-type rating scale ranging from “Very slightly or not at all” to “Extremely.” A variety of time span references have been validated for this measure and may be used when administering the PANAS (e.g., the extent you have felt this way today, the extent you generally feel this way).

The development of the PANAS reveals that it has high internal consistency reliability for both positive affect ($\alpha$ ranging from .86 to .90) and negative affect ($\alpha$ ranging from .84 to .87). The reliability of each scale was unaffected by the specific time span instruction provided to the participants. The correlation between the positive affect and negative affect scales was low
(r ranging from -.12 to -.23). No significant differences were found within participants’ affect ratings between two administrations of the scale after an 8-week interval (p > .05, 2-tailed t test). The PANAS also demonstrated good convergent validity as evidenced by its correlations with measures such as the Beck Depression Inventory (PA: r = -.35, NA: r = .56) and the Hopkins Symptom Checklist (PA: r = -.19, NA: r = .74) (Watson et al., 1988).

**Task Appraisal Questionnaire.** A brief survey (see Appendix E) was included at the end of this research study. Participants provided self-reported data on whether or not they found the mirror tracing task to be difficult or stressful, how much effort they put into the task, how important it was for them to perform well, and whether or not they typically perceived themselves as perseverant at such tasks. The response options for these items were rated on five-point Likert-type scales.

**Pandemic Stress Index.** The Pandemic Stress Index is a three-item self-reported measure intended to assess information about behavior change and stress experienced during the COVID-19 pandemic. This questionnaire was developed Harkness (2020) for their study examining the impact of COVID-19 on Latino sexual minority men and their HIV prevention behaviors. Although the aim of the original study for the Pandemic Stress Index differs from that of the current study, this measure is flexible and contains a subset of various follow-up questions that may be added depending on the focus of research.

**Pittsburgh Sleep Quality Index (PSQI).** The Pittsburgh Sleep Quality Index (PSQI) is a 19-item self-reported questionnaire that assesses overall sleep quality (Buysse et al., 1989). Each of these items are used to calculate seven component scores which include: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The sum of these seven components creates global PSQI scores that may
range from 0 to 21, with higher scores indicating worse sleep quality. Psychometric properties of the PSQI were assessed over an 18-month period with "good" sleepers (i.e., healthy subjects) and "poor" sleepers (i.e., depressed patients, sleep-disorder patients). Acceptable measures of internal homogeneity, consistency (e.g., test-retest reliability), and validity were obtained (Buysse et al., 1989). The psychometric and clinical properties of the PSQI suggest that it may be appropriately used in clinical and research settings to collect data on sleep quality.

*Items from the Behavioral Risk Factor Surveillance System (BRFSS).* The Centers for Disease Control and Prevention (CDC) developed the Behavioral Risk Factor Surveillance System (BRFSS) (see Appendix G) in 1984 as a telephone survey used to collect national data on health-related risk behaviors playing a role in premature mortality. The BRFSS collects a wide variety of information pertaining to risky health behaviors, but for the purpose of this study only 17 items were included in the online SONA Screener. Selected items assessed the following health behaviors: smoking (e.g., lifetime use, current use, time length since last use), current vaping use, sleep quantity (e.g., hours per 24-hour period), alcohol use (e.g., quantity of drinks, quantity of days consuming alcohol over the past month), physical activity (e.g., frequency of days exercised, frequency of days strengthened muscles, duration of exercise over the past month), nutrition (e.g., frequency of eating leafy vegetables, other vegetables, fruit, fried potatoes, and high-fat content foods over the past month), and general health status. Each item included follow-up questions regarding the perceived importance and difficulty for maintaining each health behavior. In a systematic review of publications examining the reliability and validity of the BRFSS, results showed that overall prevalence rates from the BRFSS were comparable to other national self-reported surveys (Pierannunzi et al., 2013). It was also found that measurement of some health behaviors was more valid or reliable than other behaviors, and
a few items lacked evidence for validity and reliability altogether. For example, the largest number of studies examining validity were completed for physical activity, access to health care, immunization and preventive testing, and diagnoses of chronic disease. The overall quality of test-retest reliability was determined to be high for these well-studied health topics (e.g., access to health care, physical activity, mental health measures) (Pierannunzi et al., 2013).

Procedure

**Screening Phase.** Participants completed an online survey questionnaire via the SONA Screener at West Virginia University. They were eligible to earn extra credit points and apply them to the undergraduate course of their choosing. The survey ended with the researcher’s contact information and an invitation to participate in the online Zoom™ session of the study.

**Experimental Phase.** Participants who accepted the invitation to complete the online session had access to the Zoom™ meeting via the SONA website, and they were sent a link to the online version of the mirror tracing persistence task using the chat message feature. At the beginning of this session, the experimenter explained components of the study to participants and obtained informed consent. Participants were given detailed instructions on how to share their screen with the researcher. This allowed the participant to complete the mirror tracing task from their computer while the researcher recorded the duration of the task, the number of errors, and the number of lines completed.

Participants began by completing the PANAS for the first time responding to instructions to focus on how they feel "right now." Following the PANAS questionnaire, the participant shared their screen for the online mirror tracing task. This free online website provides a variety of shapes which mimic the mental stress of the mirror tracing task (University of Illinois, n.d.). Once participants clicked to start, their mouse moved in a normal pattern and they outlined the
shape (i.e., a practice trial). Once they completed the shape, they clicked using their mouse to finish and clicked again to re-start the shape. For the same shape, the participant’s mouse moved in the inverse direction that they would have expected, similar to trying to draw a shape by only looking in the reflection of a mirror.

Participants were instructed to complete a simple four-sided square maze shape. They had as much time as they needed to complete the square-tracing practice task. Participants were then asked to complete as many asymmetrical advanced shapes as they could during a 20-min period. The experimenter let participants know that they were free to discontinue the task whenever they would like, when they felt they had shown mastery for the task. The experimenter informed the participant to discontinue use of their mouse or touchpad and stay seated if they decided to stop. The experimenter then started timing the participant with a stopwatch when they began their first asymmetrical advanced shape. The experimenter observed the participants via the share screen feature on Zoom™ and monitored duration of task engagement until the participant stopped or the total task period (20 min) was complete. The number of errors strayed off the outlines was recorded and counted after the participant left the online session. If there were more than 3-line crossings repeated over the same exact location on the shape, it was recorded as a maximum of 3 errors.

After completion of the 20 min task (or lesser time for those who opted out early), participants completed a second PANAS questionnaire rating how they felt during the mirror-tracing task and the task appraisal questionnaire. Afterwards, the experimenter debriefed participants and provided them with copies of their consent and debriefing forms if requested. Following this session, participants were mailed WVU research debit cards with a balance of $10 per individual and were assigned extra credit to the WVU course of their choosing.
Results

Prior to conducting the primary study analyses, variables were examined for normality, homoscedasticity, missingness, and presence of outliers. See Appendix H for information on data cleaning methodologies used for this dataset. See Table 1 for information on frequency values for each variable. Once assumptions for conducting multiple regression analyses were confirmed, relations among the three measures of perseverance were examined using Pearson product moment correlation coefficients. For the primary analyses of this study, a series of regression analyses were conducted to examine how self-reported and behavioral perseverance were associated with maintenance of various health behaviors. Predictors for each analysis included the Grit Scale – perseverance of effort subscale score, the Distress Tolerance Scale score, and task duration (i.e., behavioral perseverance). Logistic regression analyses were conducted for dichotomous health behaviors (e.g., BRFSS physical activity and vaping behaviors) as criterion variables. Ordinal regression analyses were conducted for health behaviors assessed with ordinal scales (e.g., BRFSS general health and the Pandemic Stress Index COVID-19 impact). Multiple regression analyses were conducted for the remaining health behaviors (e.g., sleep, alcohol use, physical activity, nutrition, and general health) as well as PANAS-positive affect change scores, and PANAS-negative affect change scores.

Primary Study Analyses

Self-reported and Behavioral Perseverance. Correlational analyses conducted on relations among the three measures of perseverance (i.e., the perseverance of effort subscale scores from the Grit Scale, the Distress Tolerance Scale scores, and task duration on the mirror tracing persistence task - behavioral perseverance) revealed a significant correlation between the two self-report measures of grit and distress tolerance, $r (46) = .412, p < .01$. In contrast,
correlations between behavioral perseverance and the Grit Scale subscale, \( r (46) = -.245, p = .093 \), and between behavioral perseverance and the Distress Tolerance Scale were not significant, \( r (46) = .134, p = .362 \).

**Perseverance and Sleep.** The multiple regression analysis conducted with self-reported grit, distress tolerance, and behavioral perseverance as predictors for the criterion variable of sleep from the BRFSS (e.g., How many hours of sleep do you get in a 24-hour period?) was not significant, \( R^2 (3, 44) = .053, p = .487 \). (See Table I1 in Appendix I). In contrast, the multiple regression analysis on global PSQI scores revealed a significant relation between perseverance and sleep, \( R^2 (3, 44) = .164, p < .05 \). (See Table I2 in Appendix I). Neither self-reported grit, \( \beta = -.091, p = .572 \) nor behavioral perseverance, \( \beta = -.066, p = .659 \) was associated with sleep quality, but self-reported distress tolerance was associated with PSQI sleep, \( \beta = -.349, p < .05 \). Participants with greater distress tolerance scores reported engaging in better sleep.

**Perseverance and Alcohol Use.** Multiple regression analyses conducted on the two measures of alcohol use from the BRFSS yielded no significant associations. Perseverance was not associated with either average alcoholic drinks consumed, \( R^2 (3, 42) = .036, p = .665 \), (See Table I3 in Appendix I) or number of days in which they consumed alcohol over the past 30 days, \( R^2 (3, 42) = .024, p = .794 \) (See Table I4 in Appendix I).

**Perseverance and Physical Activity.** Four items from the BRFSS assessed information on study participants’ physical activity. The first item measuring physical activity was dichotomous (i.e., “During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?”), so a logistic regression analysis was conducted. For this item, physical activity was not associated with perseverance, \( Wald test = .525, p = .469 \) (See Table I5 in Appendix I). Multiple
regression analyses were conducted to examine the effects of perseverance on the remaining three physical activity parameters. None revealed any significant associations, including physical activity frequency, $R^2 (3, 43) = .009, p = .944$ (See Table I6 in Appendix I), duration of physical activity, $R^2 (3, 44) = .027, p = .751$ (See Table I7 in Appendix I), and frequency of muscle strengthening exercises, $R^2 (3, 44) = .007, p = .955$ (see Table I8 in Appendix I).

**Perseverance and Nutrition.** Multiple regression analyses were conducted on each of the five BRFSS items that assessed participants’ diet and nutrition. Like analyses of physical activity, no significant associations were observed. This included analysis of fruit consumption, $R^2 (3, 44) = .034, p = .675$ (See Table I9 in Appendix I), green leafy or lettuce salad consumption, $R^2 (3, 43) = .060, p = .435$ (See Table I10 in Appendix I), other vegetable intake, $R^2 (3, 44) = .045, p = .562$, (See Table I11 in Appendix I), consumption of fried potatoes, $R^2 (3, 43) = .064, p = .412$ (See Table I12 in Appendix I), and high-fat content foods $R^2 (3, 43) = .082, p = .295$ (See Table I13 in Appendix I).

**Perseverance and Vaping/E-cigarette Use.** A logistic regression analysis was conducted with vaping as the criterion variable and self-reported grit, distress tolerance, and behavioral perseverance included as predictor variables because this was a dichotomous variable. Vaping behavior was not found to be associated with self-reported grit, Wald test = 2.701, $p = .100$, distress tolerance, Wald test = 1.348, $p = .246$, or behavioral perseverance, Wald test = .461, $p = .497$ (See Table I14 in Appendix I).

**Perseverance and Self-reported General Health.** Because this variable employed an ordinal scale, an ordinal regression was conducted with general health perception as the dependent variable and self-reported grit, distress tolerance, and behavioral perseverance included as predictor variables. The model fitting information contains a likelihood ratio chi-
square test to examine whether there is a significant improvement in the fit of the final model relative to the null model. For general health, there was a significant improvement in the fit of the final model over the null model, \( \chi^2 (3) = 13.632, p = .003 \) (See Table I15 in Appendix I). Within the goodness-of-fit model for this analysis, both the Pearson chi-square test, \( \chi^2 (138) = 113.679, p = .936 \), and the deviance test, \( \chi^2 (138) = 90.653, p = .999 \), were not significant, suggesting a good model fit. The parameter estimates showed that distress tolerance was a significant predictor of general health status with greater distress tolerance scores being associated with higher self-reported general health ratings, Wald test = 7.119, \( p = .008 \). Neither grit nor behavioral perseverance were significantly associated with self-reported general health.

**Perseverance and COVID-19 Health Behaviors.** Information about how participants were impacted by the COVID-19 pandemic was collected using an item from the Pandemic Stress Index ("How much is/did COVID-19 (coronavirus) impact your day-to-day life?"). An ordinal regression was conducted with COVID-19 impact as the dependent variable and self-reported grit, distress tolerance, and behavioral perseverance included as covariate variables. The model fitting information shows that adding measures of perseverance to the model did not improve the model fit, \( \chi^2 (3) = 5.473, p = .140 \) (See Table I16 in Appendix I). However, for the goodness-of-fit model estimates for this analysis, both the Pearson chi-square test \( \chi^2 (91) = 84.947, p = .659 \), and the deviance test, \( \chi^2 (91) = 80.871, p = .768 \), were non-significant, suggesting good model fit. Based upon the goodness-of-fit estimates, parameter estimates were examined for each measure of perseverance. Distress tolerance significantly predicted COVID-19 impact, so that greater distress tolerance was associated with lesser impact of COVID, Wald test = 4.773, \( p = .029 \). Neither self-reported grit nor behavioral perseverance was significantly associated with COVID-19 impact.
**Perseverance and Affect Reactivity to the Mirror Tracing Task.** Hierarchical multiple regression analyses were conducted to examine the Grit Scale - perseverance of effort subscale, Distress Tolerance Scale total scores, and duration of task time as predictors for PANAS positive affect reactivity (e.g., using simple change scores) and PANAS negative affect reactivity to the mirror-tracing task. The scores from the pre-task administration of the PANAS were included as covariates in the first step of the hierarchical regression to control for baseline effects in affect reactivity. Controlling for baseline levels of affect, perseverance was not associated with either positive affect reactivity, $R^2 \Delta (3, 43) = .111, p = .116$ (See Table I17 in Appendix I), or negative affect reactivity to the mirror-tracing task, $R^2 \Delta (3, 43) = .076, p = .253$ (See Table I18 in Appendix I).

**Mediational Analyses.** Two significant associations between distress tolerance and health behaviors were discovered, sleep quality from the PSQI and general health status from the BRFSS. Mediational analyses were conducted to determine whether perceived importance and difficulty of maintaining these health behaviors explained the relations between distress tolerance and the health behaviors. Although distress tolerance was also associated with COVID impact, this was not considered a health behavior and questions regarding mediation by perceived difficulty and importance were not asked; consequently, no mediational analysis was done for this variable. These mediational analyses were conducted in SPSS via the PROCESS macro by Andrew Hayes.

**Mediation by Perceived Difficulty.** Between the two significant relations between distress tolerance and health behaviors, a partial mediation effect was observed for perceived difficulty in maintaining healthy sleep habits in explaining the relation between distress tolerance and sleep quality measure by global PSQI. Together, distress tolerance and perceived sleep difficulty
significantly predicted PSQI, and accounted for about 36% of the variance in sleep quality, $R^2 = .3588$, $p < .001$. The direct effect of distress tolerance on sleep quality was no longer significant, $Effect = -.0831$, $t = -.1999$, $p = .0516$, $BootLLCI = -.1668$, $BootULCI = .006$, but the indirect effect was significant, $Effect = -.0479$, $BootLLCI = -.0992$, $BootULCI = -.0012$ (see Table I19 in Appendix I). Greater distress tolerance was associated with improved sleep and this relation was partially explained by lesser perceived difficulty in maintaining healthy sleeping behaviors. No indirect effect was observed for perceived difficulty in mediating the association between distress tolerance and general health, $Effect = -.0116$, $BootLLCI = -.0250$, $BootULCI = .005$ (see Table I20 in Appendix I).

Mediation by Perceived Importance. No evidence for mediation was observed for perceived importance of the either sleep quality assessed through the PSQI or ratings of general health. Regarding the test for mediation of the distress tolerance-sleep relation, no indirect effect for perceived importance was observed, $Effect = -.0075$, $BootLLCI = -.0346$, $BootULCI = .0188$ (see Table I21 in Appendix I). Likewise, no indirect effect for perceived importance was observed for mediating the relation between distress tolerance and general health, $Effect = -.0055$, $BootLLCI = -.0137$, $BootULCI = .0016$ (see Table I22 in Appendix I).

Mediation by Mood/Affect. Because no significant relations were observed between behavioral perseverance and engagement in any health behavior, no mediational analyses were conducted on mood or affective reactivity to the behavioral perseverance task.

Discussion

The purpose of this research study was to examine the association between self-reported and behavioral perseverance and various health behaviors (e.g., sleep, diet, physical activity). A novel, behavioral measure of perseverance was used as one measure of perseverance by
assessing task duration on an online mirror tracing task. Although findings failed to support an association between this measure of behavioral perseverance and engagement in any health behavior, there was limited support for such an association for one of the self-reported measures of perseverance used in this study. In a multiple regression analysis, global PSQI scores assessing sleep quality (e.g., higher scores relating to more significant sleep difficulties) were significantly related to self-reported scores on the Distress Tolerance Scale. This finding suggests that people with more distress tolerance obtain better quality sleep.

Although there are few studies examining sleep and distress tolerance, existing studies seem to support this finding. One study examining the relation between sleep disturbance, distress tolerance, and alcohol use among firefighters found that lower distress tolerance was significantly associated with greater sleep disturbance (Smith et al., 2018). In a study by Moghadam et al. (2020), mindfulness training was compared with dialectical behavior therapy on measures of sleep quality and distress tolerance. Although sleep and distress tolerance were not directly compared, both therapies resulted in improved sleep quality (e.g., reduced scores on the PSQI) and improved distress tolerance (e.g., increased scores on the DTS) which supports the possibility that change in these factors were associated in responding to treatment. Finally, a third study conducted in this area of research examined sleep quality and distress tolerance among cardiovascular surgery patients using the Distress Intolerance Index and the PSQI (Yildiz et al., 2021). Correlational analyses conducted in this study revealed that distress intolerance was positively correlated with PSQI scores (i.e., as distress intolerance increases, poor sleep quality increases as well).

In addition to sleep, distress tolerance was also found to be associated with self-reported general health status and impact of COVID-19 on the study participants’ lives. Upon conducting
an ordinal regression for perseverance variables and COVID-19 impact, distress tolerance significantly predicted COVID-19 impact (i.e., greater distress tolerance was associated with lesser impact of COVID). Numerous studies have been conducted examining the relation between distress tolerance and psychological well-being or mental health amidst the COVID-19 pandemic. The majority of these research studies support the conclusion that as distress tolerance increases, well-being and mental health during the pandemic increases as well (Akbari et al., 2021; Hyun et al., 2021; Liu et al., 2020; Mohammadi pour et al., 2021).

Contrary to the abundance of literature examining distress tolerance and psychological well-being due to COVID-19, there is a lack of research examining general physical health status and distress tolerance. Many existing studies that have examined these constructs focus on specific aspects of physical health, rather than obtaining information related to overall general health. The results from the current study suggest that greater distress tolerance is associated with higher self-reported general health. Research conducted on distress tolerance and pain experience among young adults found that perceived distress tolerance and perceived health were shown to be related, but they also existed as distinct constructs because they only shared 1% of variance (Rogers et al., 2018). In a study examining the development of the Discomfort Intolerance Scale, Schmidt et al. (2006) reported that discomfort intolerance had many of the qualities of an anxiety risk factor which had a negative association with physical health. Of note, this study did not directly measure the impact of distress tolerance on physical health outcomes and only indicated that this relation was likely to exist. Lastly, a study including adults experiencing homelessness used a multiple mediation model to show that distress tolerance partially explained that relations between depression and both perception of physical health and quality of life (Daundasekara et al., 2021). Overall, these studies support the notion that distress
tolerance and physical health are related, but additional research needs to be conducted to support these findings.

Inconsistent with expectations, the measure of behavioral perseverance employed in this study was not significantly associated with any self-reported health behaviors. Additionally, task duration (i.e., number of seconds persisted on the task) on the online mirror tracing task was not significantly correlated with either the Grit Scale or the Distress Tolerance Scale. One possibility for the lack of significant findings between behavioral perseverance and engagement in health behaviors could be that self-reported measures of grit or distress tolerance assess a different aspect of perseverance than the online mirror tracing task. The Grit Scale and the Distress Tolerance Scale may more accurately represent trait perseverance whereas the mirror tracing task appears to be a measure of state perseverance, specific to completing the mirror tracing task that was used in the current study. A trait characteristic represents a stable aspect of an individual’s personality that endures across various tasks and times (e.g., "I am a hard worker"). In contrast, state perseverance is a temporary condition that an individual experiences in response to specific situations (e.g., "I am perseverant at this task") (The Oxford Review, 2019). In predicting health behaviors that require long-term commitments to healthy living, it may not have been unexpected that a trait measure of perseverance (e.g., distress tolerance) was a better predictor of engagement in health behaviors than the behavioral measure of perseverance. Additionally, state measures of perseverance may only pertain to the type of situation used for assessing perseverance. In the current study, behavioral perseverance was measured in response to a novel learning task and the degree to which perseverance to learning tasks generalizes to perseverance in maintaining health is unknown. Had a behavioral perseverance task focusing on performance of a health maintenance task been employed, perhaps relations between behavioral perseverance
and engagement in health behaviors would have been detected. It should also be noted that the behavioral measure of perseverance employed in this study may not capture the construct fully. For instance, by equating longer persistence with the task as being perseverant, we ignored the possibility that shorter durations were more adaptive in that participants could earn their compensation more quickly and then devote the extra time to pursuing tasks more important in their lives (e.g., studying for an exam or even engaging in positive health behaviors).

The findings from this study suggest that distress tolerance predicts sleep quality, general health status, and COVID-19 impact. Follow-up questions assessing participants’ perceived difficulty and importance of health behaviors were included with the BRFSS items for sleep and general health. Tests of mediation revealed that perceived difficulty partially explained the association between distress tolerance and the maintenance of good sleep quality. This finding is supported with prior research examining the effects of difficulty and importance on task engagement (Wright, 2014). Other mediational models conducted for this study, however, were not significant.

Other health behaviors that were hypothesized to be predicted by self-reported and behavioral perseverance (e.g., nutrition, exercise behaviors, substance use) were not significantly associated with any measure of perseverance. Items from the BRFSS measuring nutrition, physical activity, alcohol use, and vaping behaviors were not associated with perseverance in this study. It was also hypothesized that mood or affect would be associated with perseverance based on previous research examining engagement in health behaviors. The results from this study showed no significant associations between positive and negative affect reactivity with any measure of self-reported or behavioral perseverance. Given the situational specificity of perseverance, it could be argued that none of the measures of perseverance employed in this
study tapped into the specific health-related perseverance required to engage and sustain a broad range of health behaviors.

**Strengths, Limitations, and Future Directions**

The mirror tracing task has been used in a variety of experimental studies examining cardiovascular reactivity to stress, but none have involved the measurement of perseverance or used this task via online methodologies. The online mirror tracing task allowed flexibility during the COVID-19 pandemic to maintain social distancing procedures while collecting data on a behavioral measure of perseverance rather than relying solely on self-reported measures (Frazier, 2022). The specific procedures and scripts used during the online mirror tracing task (see Appendix F) were effective in gaining varying times for task duration as well. Pilot data collection revealed that a shorter task duration (10 min) did not yield a broad range of behavioral perseverance (i.e., many participants persisted for the entire task period), but employing a 20-min task duration ensured a normally distributed range of behavioral perseverance. This novel procedure may be used in future studies examining reactivity to stress or state perseverance.

Naturally, all studies have limitations. The current study relied on the measurement of self-reported health behaviors using items from the Behavioral Risk Factor Surveillance System. The BRFSS is a national telephone survey that collects information about U.S. residents’ health-related risk factors, chronic health conditions, and use of preventative services (CDC). Although additional questionnaires would be time consuming to use in the current study, the BRFSS items are limited in capturing the full range of behaviors associated with nutrition, exercise, and substance use. The BRFSS items are not representative of every aspect within each health behavior (e.g., comprehensive list of food types that contribute to healthy nutrition) and therefore lack content validity. Furthermore, the sleep item from BRFSS has not been examined for
reliability and validity (Pierannunzi et al., 2013). Other general physical health surveys (e.g., The Short-form General Health Survey by Stewart et al., 1988) or commonly used questionnaires for specific health behaviors (e.g., the Dietary Habits Questionnaire by Misawa et al., 2011; the Alcohol Use Disorders Identification Test by Saunders et al., 1993) might be useful alternatives to be considered for use in future studies examining associations between positive psychological traits and physical health.

The current study is also limited by the selective sample used for purposes of data collection. Non-probability sampling was utilized for this data collection; therefore, the sample is not demographically comparable to the general population. Participants were primarily white, female, and college-educated which limits generalization of study findings to samples with different characteristics. It is also evident that this sample engages in more physical activity than the general population. Participants reported engaging in physical activity for an average of 13.47 times per month and spent an average of 69.30 minutes per activity, which equates to an average of 3 hours and 53 minutes (233 min) spent exercising per week. The CDC recommends that adults should do at least 150 to 300 minutes of moderate-intensity, or 75 to 150 minutes of vigorous-intensity physical activity each week. The CDC also reported that only 53.3% of adults in the United States meet these guidelines, indicating that this sample may be more physically active than the general population. These limited ranges of physical activity among the sample may have restricted this study’s ability to find significant results. Future studies of this type would benefit by collecting data from more diverse populations using crowdsourcing systems if necessary (e.g., Amazon Mechanical Turk).

Future research would also benefit by the creation of a self-report assessment of a broad range of health behaviors. There are no existing questionnaires that capture multiple health
behaviors (e.g., nutrition, physical activity, sleep) simultaneously. Including multiple questionnaires to capture each health behavior becomes burdensome to research participants and a single, comprehensive questionnaire with adequate psychometric characteristics would be more user-friendly. Further research should also aim to develop broader methods for assessing behavioral perseverance that includes behaviors beyond those employed in learning paradigms. Given the prolonged nature of the pandemic and its effect upon conducting in-person experiments, it would seem appropriate for future research to adapt behavioral measures using online methodologies.

In addition to a comprehensive health questionnaire, various aspects of the online mirror tracing task require examination to determine their role in affecting the parameter of behavioral perseverance. For example, participants used their laptop track pad for this study, but we do not know how completing the task using a computer mouse would affect task duration. It is also apparent that participants may interpret their goal of “mastering” the task differently. It would be beneficial for future studies to collect qualitative data on what this prompt meant to each participant to understand how this may affect their behavioral perseverance. When administering the task, directive language such as “please continue” may drastically increase perseverance on the mirror tracing task due to demand characteristics. This language was avoided for this study, but it is unknown what effects this may have on participants’ behaviors. Lastly, the maximum task duration of 20 minutes was chosen for this study based on pilot testing, but little is known regarding how shorter or longer task durations would affect study results. The detection of a normal distribution of the data on task duration suggests that the 20 min length was appropriate, but future studies should explore task durations longer than 20 minutes to examine the impact on the results of behavioral perseverance on health behaviors.
It should also be noted that this study used cross-sectional data, and therefore bidirectional associations may exist among these findings. For example, this research suggests that increased distress tolerance significantly predicts better quality sleep, but it must be considered that having a higher quality of sleep could also lead to increased distress tolerance. A longitudinal study by Kechter and Leventhal (2017) found that sleep problems were associated with some aspects of poorer distress tolerance (e.g., absorption and appraisal). Therefore, it is possible that the results from this study support their findings as well.

Although significant findings in this study were based on p-values of less than .05, error rate and power are important considerations and potential limitations for this study. There was an abundance of analyses conducted within this study, therefore increasing the likelihood for experiment-wide error. The study was likely not powered adequately to conduct as many statistical tests that were reported. For instance, there were not enough participants that smoked cigarettes to be able to compare smokers vs. non-smokers and their levels of perseverance.

Among all parameters of perseverance employed in the current study, continued research on the construct of distress tolerance is warranted. Although it was only associated with sleep quality, general health, and COVID impact in the current study, these results lend credence to new investigations using this parameter in clinical health psychology research. Results relating greater distress tolerance to better quality of sleep seem the most promising, but research into other health psychology topics may contribute to this field of research.

Conclusions

The purpose of this study was to examine the association between self-reported and behavioral perseverance and self-reported health behaviors. This research included a novel measure of behavioral perseverance using an online mirror tracing task which served as a model
for future studies using online methodologies. Although only a few significant results were observed, analyses suggested that higher distress tolerance was related to improved sleep quality, higher self-reported general health status, and a decrease in the impact of COVID-19. Future research is needed to replicate these findings, as this could have implications for public health outcomes. Many fatal illnesses (e.g., stroke, CV disease) are preventable with a proper adherence to health behaviors. If an increase in distress tolerance has a significant effect on improvement of health behavior adherence as this study suggests, then treatment to improve distress tolerance may be implemented in patients having difficulty with adherence.
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https://doi.org/10.1016/j.cpr.2019.01.003


**Table 1**

Frequency Table

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<td>Smoked 100 Cigarettes in Lifetime (Y/N)</td>
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<td>17.23</td>
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<td>11.48</td>
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<td>COVID-19 Impact</td>
<td>2.92</td>
<td>.85</td>
<td>2</td>
<td>5</td>
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</table>
Appendix A

Demographics Questionnaire

Your Information:

Age _____ yrs

What is your gender identity?

- Female
- Male
- Transgender
- Nonbinary/fluid queer/gender queer
- Not listed (please specify if you choose): ___________
- I prefer not to answer

Are you Hispanic, Latino/a, or of Spanish origin?

- No, not of Hispanic, Latino/a, or Spanish origin
- Yes, Mexican, Mexican American, Chicano/a
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino/a, or Spanish origin (please indicate) ___________

Race- check all that apply

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Chinese
○ Filipino
○ Japanese
○ Korean
○ Vietnamese
○ Native Hawaiian
○ Guamanian or Chamorro
○ Samoan
○ Other Pacific Islander (please indicate) ______________
○ Other Asian (please indicate) ______________
○ Other race (please indicate) ______________

What is the highest level of education you have completed to date?

○ High school
○ 1 year of college
○ 2 years of college
○ 3 years of college
○ 4 or more years of college

What is your intended major(s) at WVU? ______________________________
Family Information:

Imagine a ladder that represents where people stand in the United States.

At the top of the ladder are the people who are the best off – those who have the most money, the most education, and the most respected jobs. At the bottom are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

On which rung of the ladder (1 being the lowest rung and 10 being the highest rung) would you place your family?

1…………2………3………4…………5…………6………..7…………8………..9……….10
Appendix B

The Grit Scale

Directions for taking the Grit Scale: Please respond to the following 12 items. Be honest – there are no right or wrong answers!

1. I have overcome setbacks to conquer an important challenge.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

2. New ideas and projects sometimes distract me from previous ones.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

3. My interests change from year to year.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

4. Setbacks don’t discourage me.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

5. I have been obsessed with a certain idea or project for a short time but later lost interest.
   - Very much like me
   - Mostly like me
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6. I am a hard worker.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

7. I often set a goal but later choose to pursue a different one.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

8. I have difficulty maintaining my focus on projects that take more than a few months to complete.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

9. I finish whatever I begin.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

10. I have achieved a goal that took years of work.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
• Not like me at all

11. I become interested in new pursuits every few months.

• Very much like me
• Mostly like me
• Somewhat like me
• Not much like me
• Not like me at all

12. I am diligent.

• Very much like me
• Mostly like me
• Somewhat like me
• Not much like me
• Not like me at all

**Scoring for the Grit Scale**

For questions 1, 4, 6, 9, 10 and 12 assign the following points:

5 = Very much like me
4 = Mostly like me
3 = Somewhat like me
2 = Not much like me
1 = Not like me at all

For questions 2, 3, 5, 7, 8 and 11 assign the following points:

1 = Very much like me
2 = Mostly like me
3 = Somewhat like me
4 = Not much like me
5 = Not like me at all

Add up all the points and divide by 12. The maximum score on this scale is 5 (extremely gritty), and the lowest scale on this scale is 1 (not at all gritty).
Appendix C

The Distress Tolerance Scale

Directions: Think of times that you feel distressed or upset. Select the item from the menu that best describes your beliefs about feeling distressed or upset.

- Strongly agree
- Mildly agree
- Agree and disagree equally
- Mildly disagree
- Strongly disagree

1. Feeling distressed or upset is unbearable to me.

2. When I feel distressed or upset, all I can think about is how bad I feel.

3. I can’t handle feeling distressed or upset.

4. My feelings of distress are so intense that they completely take over.

5. There’s nothing worse than feeling distressed or upset.

6. I can tolerate being distressed or upset as well as most people.

7. My feelings of distress or being upset are not acceptable.

8. I’ll do anything to avoid feeling distressed or upset.

9. Other people seem to be able to tolerate feeling distressed or upset better than I can.

10. Being distressed or upset is always a major ordeal for me.

11. I am ashamed of myself when I feel distressed or upset.

12. My feelings of distress or being upset scare me.

13. I’ll do anything to stop feeling distressed or upset.

14. When I feel distressed or upset, I must do something about it immediately.

15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels.
Scoring for the Distress Tolerance Scale:

Item 6 is reverse scored. Subscale scores are the mean of the items. The higher-order DTS is formed from the mean of the four subscales. The tolerance subscale includes questions 1, 3, and 5. The absorption subscale includes questions 2, 4, and 15. The appraisal subscale includes questions 6, 7, 10, 11, and 12. The regulation subscale includes questions 8, 13, and 14.
Appendix D

The Positive and Negative Affect Schedule (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now. Use the following scale to record your answers.

1 = Very slightly or not at all
2 = A little
3 = Moderately
4 = Quite a bit
5 = Extremely

_____ interested
_____ distressed
_____ excited
_____ upset
_____ strong
_____ guilty
_____ scared
_____ hostile
_____ enthusiastic
_____ proud
_____ irritable
_____ alert
_____ ashamed
_____ inspired
_____ nervous
_____ determined
_____ attentive
_____ jittery
_____ active
_____ afraid
Appendix E

Task Appraisal Questionnaire

Use the scales provided below to answer each question.

1. How difficult was the mirror tracing task?
   1   2   3   4   5
   Very difficult  Difficult  Neither difficult nor easy  Easy  Very easy

2. How stressful was the mirror tracing task?
   1   2   3   4   5
   Very Stressful  Stressful  Somewhat stressful  Slightly stressful  Not at all stressful

3. How much effort did you put into the mirror tracing task?
   1   2   3   4   5
   A great deal of effort  Much effort  Some effort  Little Effort  No effort

4. How important was performing well on the mirror tracing task for you?
   1   2   3   4   5
   Very important  Important  Moderately important  Slightly important  Not at all important

5. How perseverant do you consider yourself to be?
   1   2   3   4   5
   Very perseverant  Perseverant  Moderately perseverant  Slightly perseverant  Not at all perseverant
Appendix F

Scripts for Recruitment and the Online Mirror Tracing Task

For email:

Hi my name is Alivia Frazier and I am a researcher for the Grit and Health study that you completed a survey for on SONA. In this survey, you indicated that you would like to participate in the follow-up experimental session. During this part of the research, you will be asked to complete an online tracing task and a few additional questionnaires. This will take approximately 30-45 minutes and you will earn $10. If you would still like to participate in this part of the research study, please sign up for a timeslot under “Grit and Health Part 2” on SONA. Please only select a time when you have internet access, will be alone, and in a private place where we can speak without being overheard. If these times do not work for you, please let me know and we can schedule another time. Also let me know if you do not have access to a laptop or desktop computer (the online task we are using does not work properly on a tablet or cell phone). Once you schedule a time for your session, you can use the Zoom link listed for your designated time slot on SONA to access our meeting. Please let me know if you have any questions or concerns. We look forward to hearing from you!

Best,
Alivia Frazier

For experimental session introduction:

(Lock the meeting)

Hi my name is Alivia Frazier and I am a researcher for the Grit and Health study that you completed a survey for on SONA. In this survey, you indicated that you would like to participate in this follow-up experimental session. Before we begin this study, I would like to review the contents of the consent form you read at the beginning of the SONA survey. Do you have any questions before I do this?

During this part of the research, you will be asked to complete an online tracing task that involves drawing shapes as if they were reflected in a mirror (i.e., in the reverse direction) using your computer mouse or laptop mousepad.

- Are you using a laptop mousepad or a computer mouse right now?
  - If laptop mousepad, continue …
  - If computer mouse, say “Would you be willing and able to switch to a laptop mousepad?”
    - If Yes, ask participant to do so and continue …
    - If No, continue session but note that they used a mouse and not a mousepad.
At two times during today’s experiment, you will also be asked to complete a few questions using an online link that you will be provided. The entire session will take approximately 15-30 minutes to complete and will be video-recorded and saved using a password-protected file for scoring after the session. The video file will be deleted as soon as it is no longer needed for this research.

Today’s research is completely voluntary and you are free to withdraw from the research at any time. You may or may not directly benefit from participating in this research. The risks from participating in this research include experiencing some frustration related to the mirror tracing task.

If you participate in this part of the research, you will be paid $10.00. Regardless of how long you continue the task, you will earn the same full amount of extra credit and money. To receive payment, you will need to provide me with your mailing address at the end of the study and I will mail you a $10 pre-paid card. Once you receive the card in the mail, send me an email note and I will activate it for you to use.

- Do you have any questions about this information?
- Do you still want to participate in today’s study?
- (If yes) What is your mailing address so that we can mail you the $10 pre-paid card?

For Mirror Tracing Task Directions:

(Make participants co-host to allow for screen sharing)

(Send questionnaire and online mirror tracing task links in the chat)

Thank you for participating in this experiment. Before we begin, I want to get a rating of how you are feeling right now. Please click on the Qualtrics link under Questionnaire 1 that I have sent you in the Chat tab and complete these questions about how you feel right now. The Chat tab is located at the bottom of your screen. Let me know when you are done and have submitted your responses.

As I mentioned earlier, you will now be asked to complete an online tracing task that involves drawing shapes as if they were reflected in a mirror (i.e., in the reverse direction) using your computer mouse or laptop mousepad. I will provide you with a lot of instructions on how to complete this task, so wait to start until I say, “Go!” This task will entail you using “Share Screen” on Zoom so that I can observe your progress on the task. Please open a new window using the link I have sent in the Zoom chat under “Mirror tracing task”. The “Chat” tab is located at the bottom of your screen.

Once this is open on your browser, come back to Zoom and click the green button at the bottom middle of your screen that says “Share Screen”. Then, double-click the tab that shows the online mirror tracing task on your internet browser. This will allow me to observe exactly what you see on your computer screen. Thanks, I can see it now.
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The images at the top of this website show what this task traditionally looks like in person. We are using the revised online version of this task due to COVID-19 social distancing restrictions. Now please listen to the following instructions before we begin:

First, I would like you to complete a practice trial to get a feel for how to navigate the shape with your mouse or mousepad. The practice trial does not count toward your final score on the task. Let’s start with the square shape. Go ahead and click on the square shape to launch the practice trial and using your finger on the mousepad (the mouse) trace the shape staying between the lines as quickly as you can in a clockwise direction. You will click once on your mousepad inside the red circle, but not hold down, to start tracing and to stop the task when you are finished. Also, make sure that the entirety each shape fits onto your computer screen before starting the task.

Ready? Go! [Participant completes tracing of the square shape].

Very good, now we are going to make it a little trickier. In this next part of the practice trial moving your finger (mouse) to the right results in the red line moving to the left. As with the first part of the practice trial, you should trace the square in a clockwise direction, but remember, right is left and left is right. This means that you will need to move your mouse left to trace the shape in a clockwise direction. For this task, up is still up and down is still down, only right and left are reversed. Do you have any questions before we start? Ready? Go! [Participant completes reverse tracing of the square shape].

Good! You have the hang of it. For the rest of the remaining trials, we are going to use some asymmetrical advanced shapes. You will have as much time as you need to complete as many shapes as you would like to show mastery of this task. Remember that regardless of how long you continue this task, that you will earn the same full amount of extra credit and money. Feel free to stop the task at any time. Do you have any questions before I provide additional instructions for the actual experimental task?

Once you click on the advanced shape 1, it will first be formatted for you to complete the shape without the reversed movement of your mouse (that is, just normal tracing). When I ask you to start, I want you to skip this step by clicking once, slightly moving your mouse about an inch or so, then clicking again. This will bring you to the mirror tracing task with your mouse moving in the reverse direction to begin the task. You do not need to hold down any buttons to trace the shape, just move your finger (mouse) and it will trace the shape in red. Please trace the shapes in a clockwise direction.

If you accidentally press down on your computer mouse or laptop mousepad, it will stop the task. Please try to avoid this, but if you accidentally press down or click during the task, you will just need to start the same shape over. We are recording the number of line segments you complete, so it is not an issue to start the shape over. When you go out of the lines that you are tracing, just do your best to get back inside the line and continue tracing the shape. Once you complete a shape, you can click the Reset button at the middle of your screen to start the next shape (i.e., you will only use advanced shape 1). You will again have to click, slightly move your mouse, and click again to move on to the actual task each time you start a new shape. During the task, I will turn my camera off and mute myself but I will still be in the room. Do you have any questions?
When I say “Go” I want you to start the task. I am now recording the session for later scoring. Please begin by clicking on the dropdown box at the left of your screen that currently says “Square”. Then select “Advanced Shape 1” and click Reset. As a reminder, you can go ahead now and click once, move your mouse about an inch, then click again to arrive at the actual task. You will need to do this each time you click “Reset” to start a new shape. You can do as many shape tracings as you wish to show mastery of this task, but are free to stop at any time. Please tell me when you are stopping the task by saying, “I’m done.”

Go!

*(Start timing – up to 20 minutes)*

*(After the task is complete)*

**If participants quit before the full 20 minutes is over:**
Okay, you may now click the red “Stop Share” button at the top of your screen to quit sharing your computer screen with me. Now, go back to the “Chat” to complete questionnaires 2 and 3. Please complete these questions based upon your experience completing the mirror tracing task today.

**If the participants continue for the full 20 minutes:**
It seems like you have mastered this task, so you can quit now. You may click the red “Stop Share” button at the top of your screen to quit sharing your computer screen with me. Now, go back to the “Chat” to complete questionnaires 2 and 3. Please complete these questions based upon your experience completing the mirror tracing task today.

*(After the questionnaires are complete)*

**Debriefing Information:**

Thank you for your time today, and you should receive your $10 pre-paid card within two weeks. Before we wrap up today, I would like to share with you my hypothesis and why I think this study is important. I am interested in the association between measures of perseverance and various health behaviors like sleep, eating a healthy diet, and physical activity. We obtained two self-report measures of grit and perseverance from your SONA questionnaire a few weeks ago and measured your actual perseverance today using the mirror-tracing task. My hypothesis is that both self-reported and behavioral perseverance will be associated with increased positive health behaviors. This might help explain why some people persevere or stick with attempts to engage in positive health behaviors and others have trouble doing so. There is not a lot of research examining the association between positive psychological traits like perseverance and health behaviors, and I hope to change that so we can learn how these positive traits help people engage in healthy lifestyles. Thank you for contributing to psychological science and helping us expand our knowledge on this area of research. Do you have any questions for me before I end our meeting?
Appendix G

Items from the Behavioral Risk Factor Surveillance System (BRFSS)

About how much do you weigh without shoes on?

_____ pounds

About how tall are you without shoes on?

_____ feet _____ inches

1. Have you smoked at least 100 cigarettes in your entire lifetime?

   1 = Yes
   2 = No

2. Do you now smoke cigarettes every day, some days, or not at all?

   1 = Every day
   2 = Some days
   3 = Not at all

3. How long has it been since you last smoked a cigarette, even one or two puffs?

   1 = Within the past month
   2 = Within the past 3 months
   3 = Within the past 6 months
   4 = Within the past year
   5 = Within the past 5 years
   6 = Within the past 10 years
   7 = 10 years or more
   8 = Never smoked regularly

1-3a. How important is it for you to maintain healthy non-smoking behaviors?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>Important</td>
<td>Moderately important</td>
<td>Slightly important</td>
<td>Not at all important</td>
</tr>
</tbody>
</table>

1-3b. How difficult is it for you to maintain healthy non-smoking behaviors?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very difficult</td>
<td>Difficult</td>
<td>Neither difficult nor easy</td>
<td>Easy</td>
<td>Very easy</td>
</tr>
</tbody>
</table>
4. Do you now use e-cigarettes or other electronic vaping products every day, some days, or not at all?

1 = Every day  2 = Some days  3 = Not at all

2a. How important is it for you to maintain healthy non-vaping behaviors?

1 2 3 4 5
Very important Important Moderately Slightly not at all important important

2b. How difficult is it for you to maintain healthy non-vaping behaviors?

1 2 3 4 5
Very difficult Difficult Neither difficult Easy Very easy nor easy

5. On average, how many hours of sleep do you get in a 24-hour period?

_______ hours

3a. How important is it for you to maintain healthy sleep behaviors?

1 2 3 4 5
Very important Important Moderately Slightly not at all important important

3b. How difficult is it for you to maintain a healthy sleep behaviors?

1 2 3 4 5
Very difficult Difficult Neither difficult Easy Very easy nor easy

6. One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?

_______ drinks (0 if you did not drink)

4a. How important is it for you to maintain healthy drinking behaviors?

1 2 3 4 5
Very important Important Moderately Slightly not at all important important
4b. How difficult is it for you to maintain healthy drinking behaviors?


7. During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?

1 = Yes  2 = No

5a. How important is it for you to maintain healthy physical activity behaviors?

1. Very important  2. Important  3. Moderately important  4. Slightly important  5. Not at all important

5b. How difficult is it for you to maintain healthy physical activity behaviors?


8. Now think about the foods you ate or drank during the past month, that is, the past 30 days, including meals and snacks. Not including juices, how often did you eat fruit? You can tell me times per day, times per week or times per month. (Only answer fill in one blank below)

_______ times per week

_______ times per month

9. How often did you eat a green leafy or lettuce salad, with or without other vegetables?

_______ times per week

_______ times per month
10. Not including lettuce salads and potatoes, how often did you eat other vegetables?

________ times per week

________ times per month

6-8a. How important is it for you to maintain healthy nutrition behaviors?

1. Very important
2. Important
3. Moderately important
4. Slightly important
5. Not at all important

6-8b. How difficult is it for you to maintain healthy nutrition behaviors?

1. Very difficult
2. Difficult
3. Neither difficult nor easy
4. Easy
5. Very easy

11. Would you say that in general your health is—

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

9a. In general, how important is it for you to maintain healthy behaviors?

1. Very important
2. Important
3. Moderately important
4. Slightly important
5. Not at all important

9b. In general, how difficult is it for you to maintain healthy behaviors?

1. Very difficult
2. Difficult
3. Neither difficult nor easy
4. Easy
5. Very easy
Appendix H

Data Cleaning Methodologies

**Missing Data.** Missingness was examined for all variables included in the primary analyses. With the exception of two physical activity items and three nutrition items, less than 5% of the data were missing (See Table H1 listed below). For physical activity (items 3 and 4) and nutrition (items 1-3), expectation maximization was utilized to replace these missing data points. For other variables with less than 5% of data missing, missing values replacement was not implemented. See Table H1 for the new frequency results for missing data.

**Outliers.** There was an outlier (i.e., greater than 3.3 standard deviations away from the mean) on the following variables: the first administration of the PANAS, sleep, alcohol item 1, exercise items 3-4, and nutrition items 1 and 4. Upon review of the data, one participant's data on the first alcohol item was removed due to the extremeness of this data to reduce its effect on analyses conducted for this variable. One participant's data on the first nutrition item and another participant's data on the fourth nutrition item were removed due to similar circumstances. All other outliers were subjectively concluded to be appropriate answers for each item and remained in the dataset. No multivariate outliers were found to have undue influence on the data distributions.

**Normality, Skewness, and Kurtosis.** Distributions were examined for adherence to assumptions of normality, linearity, and homoscedasticity in SPSS for all continuous variables. There was an absence of multicollinearity found for each independent variable as evidenced by tolerance values greater than .20 and variance-inflation factors less than 4.0. Many continuous health behavior variables were skewed and/or kurtotic (e.g., cigarette, alcohol, and nutrition items) (See Table H1). Variables displaying significant skew or kurtosis were transformed using
either square root or logarithm transformations to approximate normal distributions (See Table H1). Histograms of frequencies, scatterplots, and PP-plots were examined in SPSS and no violations of normality for study variables were found.

**Excluded Variables.** All BRFSS items examining cigarette use were excluded from these analyses due to their dichotomous nature and a lack of power (i.e., there were not enough participants who were smokers, \( n = 3 \)). A similar circumstance occurred for the social distancing item from the PSI questionnaire in which there were not enough participants (\( n = 6 \)) that did not practice social distancing to compare with those who did.

Other variables were collected to examine their potential role as mediators or moderators of any significant associations between the behavioral measure of perseverance and health behavior engagement. These included task performance, errors on the mirror tracing task, and task appraisals. However, because no significant associations were observed between the behavioral measure of perseverance and any health behavior, these data were not analyzed. Finally, one participant was entirely removed from the dataset due to skipping the majority of questions on almost all self-reported measures.
Table H1
Data Cleaning Methodologies

<table>
<thead>
<tr>
<th>Variable</th>
<th>Missing</th>
<th>Replaced Missing</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Post-transformation skewness</th>
<th>Post-transformation kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Duration (seconds)</td>
<td>0</td>
<td>0</td>
<td>-.158</td>
<td>-1.389</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>First Positive PANAS</td>
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<td>0</td>
<td>.003</td>
<td>-.436</td>
<td>N/A</td>
<td>N/A</td>
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<td>First Negative PANAS</td>
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<td>0</td>
<td>1.684</td>
<td>3.186</td>
<td>1.086</td>
<td>.907</td>
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<tr>
<td>Second Positive PANAS</td>
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<td>0</td>
<td>.138</td>
<td>-.535</td>
<td>N/A</td>
<td>N/A</td>
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<td>Second Negative PANAS</td>
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<td>0</td>
<td>.594</td>
<td>-.318</td>
<td>.110</td>
<td>-.713</td>
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<tr>
<td>Grit Scale – Perseverance Subscale</td>
<td>1</td>
<td>0</td>
<td>-.344</td>
<td>-.509</td>
<td>N/A</td>
<td>N/A</td>
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<td>Distress Tolerance</td>
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<td>0</td>
<td>-.132</td>
<td>-.562</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Smoked 100 Cigarettes in Lifetime (Y/N)</td>
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<td>0</td>
<td>3.732</td>
<td>12.449</td>
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<td>N/A</td>
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<td>Currently Smoking Cigarettes (Y/N)</td>
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<td>0</td>
<td>2.676</td>
<td>5.383</td>
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<tr>
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<td>.924</td>
<td>-1.762</td>
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<td>Currently Vaping (Y/N)</td>
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<td>0</td>
<td>1.065</td>
<td>-.905</td>
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<tr>
<td>Sleep Quantity (Hours)</td>
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<td>0</td>
<td>.601</td>
<td>2.824</td>
<td>.028</td>
<td>2.131</td>
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<td>Quantity of Alcoholic Drinks in Past Month</td>
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<td>1</td>
<td>5.172</td>
<td>31.178</td>
<td>.771</td>
<td>.347</td>
</tr>
<tr>
<td>Number of Days Consumed Alcohol in Past Month</td>
<td>2</td>
<td>1</td>
<td>.759</td>
<td>-.773</td>
<td>.347</td>
<td>-1.710</td>
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<td>Exercise in the Past Month (Y/N)</td>
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<td>0</td>
<td>-2.676</td>
<td>5.383</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Exercise Frequency (Per Month)</td>
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<td>1</td>
<td>1.071</td>
<td>2.742</td>
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<td>.653</td>
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<tr>
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<td>-.357</td>
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<td>N/A</td>
</tr>
<tr>
<td>Frequency (Per Month)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Fruit Consumption (Per Month)</td>
<td>3</td>
<td>0</td>
<td>.986</td>
<td>1.210</td>
<td>.732</td>
<td>2.054</td>
</tr>
<tr>
<td>Green Leafy or Lettuce Salad Consumption (Per Month)</td>
<td>3</td>
<td>0</td>
<td>1.324</td>
<td>1.661</td>
<td>.452</td>
<td>-.266</td>
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<td>Other Vegetable Consumption (Per Month)</td>
<td>4</td>
<td>0</td>
<td>1.627</td>
<td>3.863</td>
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<td>.618</td>
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<td>Fried Potato Consumption (Per Month)</td>
<td>2</td>
<td>1</td>
<td>.363</td>
<td>-.762</td>
<td>.098</td>
<td>1.165</td>
</tr>
<tr>
<td>High Fat Content Food Consumption (Per Month)</td>
<td>2</td>
<td>1</td>
<td>1.867</td>
<td>3.721</td>
<td>.853</td>
<td>.532</td>
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<td>General Health</td>
<td>1</td>
<td>0</td>
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<td>.212</td>
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<td>N/A</td>
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<td>PSQI (Sleep Quality)</td>
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<td>-.867</td>
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<td>N/A</td>
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<td>-2.342</td>
<td>3.633</td>
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<td>N/A</td>
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<td>COVID-19 Impact</td>
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<td>1.702</td>
<td>.864</td>
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### Appendix I

**SPSS Results for Analyses**

#### Table I1

*Sleep Quantity - BRFSS (Hours)*

<table>
<thead>
<tr>
<th>Model</th>
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<th>R Square</th>
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<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
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</thead>
<tbody>
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<td>.653</td>
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<td>3</td>
<td>44</td>
<td>.487</td>
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</table>

a. Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance

#### Coefficients

<table>
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<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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<td>B</td>
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<td>Beta</td>
<td></td>
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<td>.012</td>
<td>-.164</td>
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<tr>
<td></td>
<td>Distress Tolerance</td>
<td>.006</td>
<td>.004</td>
<td>.253</td>
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a. Dependent Variable: Sleep Quantity

#### Table I2

*Overall Sleep Quality - PSQI*

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<th>Adjusted R Square</th>
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<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.405*</td>
<td>.164</td>
<td>.107</td>
<td>3.573</td>
<td>.164</td>
<td>2.870</td>
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<td>44</td>
<td>.047</td>
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</table>

a. Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance
### Coefficients\(^a\)

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<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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<td>Std. Error</td>
<td>Beta</td>
<td></td>
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<td>16.367</td>
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<td>4.110</td>
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<td></td>
<td>Grit Scale Perseverance</td>
<td>-.096</td>
<td>.168</td>
<td>-.091</td>
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<td></td>
<td>Distress Tolerance</td>
<td>-.116</td>
<td>.052</td>
<td>-.349</td>
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<td></td>
<td>Task Duration</td>
<td>-.001</td>
<td>.002</td>
<td>-.066</td>
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</table>

\(^a\) Dependent Variable: PSQI Sleep Quality

### Table I3

*Quantity of Alcoholic Drinks in Past Month - BRFSS*

#### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.91*</td>
<td>.036</td>
<td>-.032</td>
<td>.39788</td>
<td>.036</td>
<td>.528</td>
<td>3</td>
<td>42</td>
<td>.865</td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), Distress Tolerance, Task Duration, Grit Scale Perseverance

#### Coefficients\(^a\)

<table>
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<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
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<tr>
<td>1</td>
<td>(Constant)</td>
<td>.563</td>
<td>.436</td>
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<td>Task Duration</td>
<td>8.75E-5</td>
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<td>.078</td>
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<td></td>
<td>Grit Scale Perseverance</td>
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</tr>
<tr>
<td></td>
<td>Distress Tolerance</td>
<td>.003</td>
<td>.006</td>
<td>.089</td>
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</table>

\(^a\) Dependent Variable: log_alcohol_1

### Table I4

*Number of Days Consumed Alcohol in Past Month - BRFSS*

#### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.55*</td>
<td>.024</td>
<td>-.046</td>
<td>.43588</td>
<td>.024</td>
<td>.344</td>
<td>3</td>
<td>42</td>
<td>.794</td>
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</table>

\(^a\) Predictors: (Constant), Distress Tolerance, Task Duration, Grit Scale Perseverance
### Table I5
**Exercise in the Past Month - BRFSS (Y/N)**

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<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1&lt;sup&gt;a&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Duration</td>
<td>0.001</td>
<td>0.002</td>
<td>0.525</td>
<td>1</td>
<td>0.469</td>
<td>1.001</td>
</tr>
<tr>
<td>Grit Scale Perseverance</td>
<td>-0.312</td>
<td>0.215</td>
<td>2.106</td>
<td>1</td>
<td>0.147</td>
<td>0.732</td>
</tr>
<tr>
<td>Distress Tolerance</td>
<td>0.060</td>
<td>0.050</td>
<td>1.430</td>
<td>1</td>
<td>0.232</td>
<td>1.062</td>
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<td>0.195</td>
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<sup>a</sup> Variable(s) entered on step 1: Task Duration, Grit Scale Perseverance, Distress Tolerance.

### Table I6
**Exercise Frequency - BRFSS (Per Month)**

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<th></th>
<th></th>
<th></th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>0.94&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.09</td>
<td>0.09</td>
<td>1.484</td>
<td>0.09</td>
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</table>

<sup>a</sup> Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance
### Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.2621</td>
<td>.1616</td>
<td>1.622</td>
<td>.112</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grit Scale Perseverance</td>
<td>.025</td>
<td>.068</td>
<td>.065</td>
<td>.370</td>
</tr>
<tr>
<td>Distress Tolerance</td>
<td>.005</td>
<td>.021</td>
<td>.040</td>
<td>.234</td>
</tr>
<tr>
<td>Task Duration</td>
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<td>.001</td>
<td>-.017</td>
<td>-.108</td>
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</table>

\(^a\) Dependent Variable: Physical Activity Frequency

### Table I7

**Duration of Exercise – BRFSS (Minutes)**

#### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
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<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.164*</td>
<td>.027</td>
<td>-.040</td>
<td>45.315</td>
<td>.027</td>
<td>.033</td>
<td>3</td>
<td>44</td>
<td>.751</td>
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</tbody>
</table>

\(^a\) Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance

#### Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.32630</td>
<td>.49677</td>
<td>.657</td>
<td>.515</td>
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<tr>
<td>(Constant)</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>Grit Scale Perseverance</td>
<td>1.198</td>
<td>2.105</td>
<td>.098</td>
<td>.569</td>
</tr>
<tr>
<td>Distress Tolerance</td>
<td>.306</td>
<td>.650</td>
<td>.080</td>
<td>.470</td>
</tr>
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<td>Task Duration</td>
<td>-.007</td>
<td>.021</td>
<td>-.053</td>
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</table>

\(^a\) Dependent Variable: Duration of Physical Activity
**Table 18**

Muscle Strengthening Frequency – BRFSS (Per Month)

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.086 *</td>
<td>.007</td>
<td>- .090</td>
<td>7.137</td>
<td>.108</td>
<td>3</td>
<td>44</td>
<td>.955</td>
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</tr>
</tbody>
</table>

*Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance*

**Coefficients**

<table>
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<th>Unstandardized Coefficients B</th>
<th>Std. Error</th>
<th>Standardized Coefficients Beta</th>
<th>t</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>1 (Constant)</td>
<td>9.147</td>
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<td>1.185</td>
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<tr>
<td>Grit Scale Perseverance</td>
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<td>.327</td>
<td>-.317</td>
<td>.753</td>
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</tr>
<tr>
<td>Distress Tolerance</td>
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<td>.101</td>
<td>.344</td>
<td>.732</td>
<td></td>
</tr>
<tr>
<td>Task Duration</td>
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<td>.003</td>
<td>-.524</td>
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</table>

*Dependent Variable: Frequency of Muscle Exercises*

**Table 19**

Fruit Consumption – BRFSS (Per Month)

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
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<td>.184 *</td>
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<td>-.032</td>
<td>1.82591</td>
<td>.034</td>
<td>.514</td>
<td>3</td>
<td>44</td>
<td>.675</td>
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</table>

*Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance*

**Coefficients**

<table>
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<th>Unstandardized Coefficients B</th>
<th>Std. Error</th>
<th>Standardized Coefficients Beta</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Constant)</td>
<td>2.005</td>
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<td>1.013</td>
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<td>Grit Scale Perseverance</td>
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<td>.084</td>
<td>.160</td>
<td>.358</td>
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</tr>
<tr>
<td>Distress Tolerance</td>
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<td>.026</td>
<td>.296</td>
<td>.768</td>
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</tr>
<tr>
<td>Task Duration</td>
<td>.000</td>
<td>.001</td>
<td>.285</td>
<td>.777</td>
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</tr>
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</table>

*Dependent Variable: Fruit Consumption*
**Table I10**
*Green Leafy or Lettuce Salad Consumption – BRFSS (Per Month)*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adj R Square</th>
<th>Std. Error of Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>d1</th>
<th>d2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.244*</td>
<td>.090</td>
<td>-.005</td>
<td>1.63203</td>
<td>.660</td>
<td>.928</td>
<td>3</td>
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<td>.435</td>
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</tbody>
</table>

*a* Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance

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<tbody>
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<td><strong>Model</strong></td>
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</tr>
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<td></td>
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<tr>
<td></td>
</tr>
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</table>

*a* Dependent Variable: Salad Consumption

---

**Table I11**
*Other Vegetable Consumption – BRFSS (Per Month)*

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adj R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>d1</th>
<th>d2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.212*</td>
<td>.045</td>
<td>-.020</td>
<td>1.33439</td>
<td>.045</td>
<td>.892</td>
<td>3</td>
<td>44</td>
<td>.562</td>
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</table>

*a* Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance
### Table II2

**Fried Potato Consumption – BRFSS (Per Month)**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.253*</td>
<td>.064</td>
<td>-.001</td>
<td>.064</td>
<td>.977</td>
<td>3</td>
<td>43</td>
<td>.412</td>
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</tbody>
</table>

*a. Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance*

### Table I13

**High Fat Content Food Consumption – BRFSS (Per Month)**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig F Change</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.286*</td>
<td>.082</td>
<td>.018</td>
<td>1.83537</td>
<td>.882</td>
<td>1.275</td>
<td>3</td>
<td>43</td>
<td>.295</td>
</tr>
</tbody>
</table>

*a. Predictors: (Constant), Task Duration, Distress Tolerance, Grit Scale Perseverance*

### Coefficients

**Table I12**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>2.913</td>
</tr>
<tr>
<td></td>
<td>Grit Scale Perseverance</td>
<td>.064</td>
</tr>
<tr>
<td></td>
<td>Distress Tolerance</td>
<td>-.005</td>
</tr>
<tr>
<td></td>
<td>Task Duration</td>
<td>.000</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: Vegetable Consumption*

**Table I13**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>4.995</td>
</tr>
<tr>
<td></td>
<td>Grit Scale Perseverance</td>
<td>-.066</td>
</tr>
<tr>
<td></td>
<td>Distress Tolerance</td>
<td>-.007</td>
</tr>
<tr>
<td></td>
<td>Task Duration</td>
<td>.000</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: Fried Potato Consumption*
## Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>.510</td>
<td>1.990</td>
<td>.257</td>
<td>.799</td>
</tr>
<tr>
<td></td>
<td>.083</td>
<td>.084</td>
<td>.167</td>
<td>.984</td>
</tr>
<tr>
<td></td>
<td>.009</td>
<td>.026</td>
<td>.059</td>
<td>.357</td>
</tr>
<tr>
<td></td>
<td>.001</td>
<td>.001</td>
<td>.240</td>
<td>1.534</td>
</tr>
</tbody>
</table>

- Dependent Variable: High-fat Content Consumption

### Table I14

**Currently Vaping — BRFSS (Y/N)**

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Duration</td>
<td>-.001</td>
<td>.001</td>
<td>.461</td>
<td>1</td>
<td>.497</td>
<td>.999</td>
</tr>
<tr>
<td>Grit Scale Perseverance</td>
<td>-.177</td>
<td>.108</td>
<td>2.701</td>
<td>1</td>
<td>.100</td>
<td>.838</td>
</tr>
<tr>
<td>Distress Tolerance</td>
<td>.039</td>
<td>.034</td>
<td>1.348</td>
<td>1</td>
<td>.246</td>
<td>1.040</td>
</tr>
<tr>
<td>Constant</td>
<td>1.665</td>
<td>2.471</td>
<td>.454</td>
<td>1</td>
<td>.500</td>
<td>5.236</td>
</tr>
</tbody>
</table>

- Variable(s) entered on step 1: Task Duration, Grit Scale Perseverance, Distress Tolerance.

### Table I15

**General Health - BRFSS**

<table>
<thead>
<tr>
<th>Model Fitting Information</th>
<th>-2 Log Likelihood</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept Only</td>
<td>104.285</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>90.653</td>
<td>13.632</td>
<td>3</td>
<td>.003</td>
</tr>
</tbody>
</table>

Link function: Logit.
### Goodness-of-Fit

<table>
<thead>
<tr>
<th></th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>113.679</td>
<td>138</td>
<td>.936</td>
</tr>
<tr>
<td>Deviance</td>
<td>90.653</td>
<td>138</td>
<td>.999</td>
</tr>
</tbody>
</table>

Link function: Logit.

### Parameter Estimates

<table>
<thead>
<tr>
<th></th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Wald</th>
<th>df</th>
<th>Sig</th>
<th>85% Confidence Interval</th>
<th>85% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
<td>Upper Bound</td>
</tr>
<tr>
<td><strong>Threshold</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[GenHealth = 3]</td>
<td>-1.980</td>
<td>2.191</td>
<td>0.823</td>
<td>1</td>
<td>.364</td>
<td>-6.203</td>
<td>2.307</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task_Duration</td>
<td>.001</td>
<td>.001</td>
<td>2.165</td>
<td>1</td>
<td>.138</td>
<td>.000</td>
<td>.003</td>
</tr>
<tr>
<td>Orit_Scale_Perseverance</td>
<td>-.071</td>
<td>.093</td>
<td>.579</td>
<td>1</td>
<td>.447</td>
<td>-.253</td>
<td>.112</td>
</tr>
<tr>
<td>Distress_Tolerance</td>
<td>-.083</td>
<td>.031</td>
<td>7.119</td>
<td>1</td>
<td>.008</td>
<td>-.145</td>
<td>-.022</td>
</tr>
</tbody>
</table>

Link function: Logit.

Table **116**

*COVID-19 Impact - PSI*
### Model Fitting Information

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 Log Likelihood</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept Only</td>
<td>85.344</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final</td>
<td>80.871</td>
<td>5.473</td>
<td>3</td>
<td>.140</td>
</tr>
</tbody>
</table>

Link function: Logit.

### Goodness-of-Fit

<table>
<thead>
<tr>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson</td>
<td>84.947</td>
<td>91</td>
</tr>
<tr>
<td>Deviance</td>
<td>80.871</td>
<td>91</td>
</tr>
</tbody>
</table>

Link function: Logit.

### Parameter Estimates

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Estimate</th>
<th>Std. Error</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>[COVIDimpact = 2]</td>
<td>-1.825</td>
<td>2.234</td>
<td>.667</td>
<td>1</td>
<td>.414</td>
<td>-6.205, 2.554</td>
</tr>
<tr>
<td>Location</td>
<td>Task_Duration</td>
<td>.091</td>
<td>.001</td>
<td>568</td>
<td>1</td>
<td>.443</td>
</tr>
<tr>
<td></td>
<td>Gmt_Scale_Perseverance</td>
<td>.081</td>
<td>.049</td>
<td>741</td>
<td>1</td>
<td>.369</td>
</tr>
<tr>
<td></td>
<td>Distress_Tolerance</td>
<td>-.068</td>
<td>.031</td>
<td>4773</td>
<td>1</td>
<td>.920</td>
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</tbody>
</table>

Link function: Logit.

**Table I17**

*Positive Affect Reactivity - PANAS*
### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>352a</td>
<td>.124</td>
<td>.105</td>
<td>6.93240</td>
<td>.124</td>
<td>6.513</td>
<td>1</td>
<td>46</td>
<td>.014</td>
</tr>
<tr>
<td>2</td>
<td>488b</td>
<td>.235</td>
<td>.164</td>
<td>5.44252</td>
<td>.111</td>
<td>2.089</td>
<td>3</td>
<td>43</td>
<td>.116</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), First PANAS - Positive
b. Predictors: (Constant), First PANAS - Positive, Task Duration, Distress Tolerance, Grit Scale Perseverance

### Coefficientsa

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>-6.144</td>
<td>2.993</td>
<td>-2.052</td>
</tr>
<tr>
<td></td>
<td>First PANAS - Positive</td>
<td>.243</td>
<td>.095</td>
<td>.352</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td>1.083</td>
<td>5.913</td>
<td>.183</td>
</tr>
<tr>
<td></td>
<td>First PANAS - Positive</td>
<td>.349</td>
<td>.105</td>
<td>.505</td>
</tr>
<tr>
<td></td>
<td>Task Duration</td>
<td>.002</td>
<td>.002</td>
<td>.126</td>
</tr>
<tr>
<td></td>
<td>Grit Scale Perseverance</td>
<td>-.297</td>
<td>.272</td>
<td>-.185</td>
</tr>
<tr>
<td></td>
<td>Distress Tolerance</td>
<td>-.111</td>
<td>.077</td>
<td>-.218</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Positive Affect Reactivity

---

**Table 118**

*Negative Affect Reactivity - PANAS*
### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.388*</td>
<td>.149</td>
<td>.131</td>
<td>.0856</td>
<td>.149</td>
<td>8.077</td>
<td>1</td>
<td>46</td>
<td>.007</td>
</tr>
<tr>
<td>2</td>
<td>.475b</td>
<td>.226</td>
<td>.154</td>
<td>.09727</td>
<td>.078</td>
<td>1.411</td>
<td>3</td>
<td>43</td>
<td>.253</td>
</tr>
</tbody>
</table>

*a. Predictors: (Constant), First PANAS - Negative
b. Predictors: (Constant), First PANAS - Negative, Grit Scale Perseverance, Task Duration, Distress Tolerance

### Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>-.566</td>
<td>.165</td>
<td>-3.439</td>
</tr>
<tr>
<td></td>
<td>First PANAS - Negative</td>
<td>.423</td>
<td>.149</td>
<td>.386</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td>-.543</td>
<td>.217</td>
<td>-2.508</td>
</tr>
<tr>
<td></td>
<td>First PANAS - Negative</td>
<td>.365</td>
<td>.166</td>
<td>.334</td>
</tr>
<tr>
<td></td>
<td>Task Duration</td>
<td>-5.969E-5</td>
<td>.000</td>
<td>-.196</td>
</tr>
<tr>
<td></td>
<td>Grit Scale Perseverance</td>
<td>.005</td>
<td>.005</td>
<td>.163</td>
</tr>
<tr>
<td></td>
<td>Distress Tolerance</td>
<td>.000</td>
<td>.002</td>
<td>-.044</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: Negative Affect Reactivity

---

**Table I19**

*Distress Tolerance and Sleep Quality – Mediation by Perceived Difficulty*

Model : 4
Y : PSQI Sleep Quality
X : Distress Tolerance (DT)
M : Sleep Difficulty (SlpDiff)

**OUTCOME VARIABLE:**
PSQI Sleep Quality

**Model Summary**

<table>
<thead>
<tr>
<th>R</th>
<th>R-sq</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.5990</td>
<td>.3588</td>
<td>10.1149</td>
<td>12.5927</td>
<td>2.0000</td>
<td>45.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

**Model**

<table>
<thead>
<tr>
<th>coeff</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant 16.5580</td>
<td>2.0421</td>
<td>8.1082</td>
<td>.0000</td>
<td>12.4449</td>
<td>20.6711</td>
</tr>
<tr>
<td>DT -.0831</td>
<td>.0416</td>
<td>-1.9999</td>
<td>.0516</td>
<td>-.1668</td>
<td>.0006</td>
</tr>
<tr>
<td>SlpDiff -1.6090</td>
<td>.4265</td>
<td>-3.7722</td>
<td>.0005</td>
<td>-2.4681</td>
<td>-.7499</td>
</tr>
</tbody>
</table>

*************** DIRECT AND INDIRECT EFFECTS OF X ON Y ***************

**Direct effect of X on Y**

<table>
<thead>
<tr>
<th>Effect</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.0831</td>
<td>.0416</td>
<td>-1.9999</td>
<td>.0516</td>
<td>-.1668</td>
<td>.0006</td>
</tr>
</tbody>
</table>

**Indirect effect(s) of X on Y:**

<table>
<thead>
<tr>
<th>Effect</th>
<th>BootSE</th>
<th>BootLLCI</th>
<th>BootULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SlpDiff</td>
<td>-.0479</td>
<td>.0248</td>
<td>-.0992</td>
</tr>
</tbody>
</table>

**Table 120**

*Distress Tolerance and General Health Status – Mediation by Perceived Difficulty*

**Model : 4**

Y : General Health Status
X : Distress Tolerance (DT)
M : General Health Difficulty (GH_Diff)

**OUTCOME VARIABLE:**
General Health Status

**Model Summary**

<table>
<thead>
<tr>
<th>R</th>
<th>R-sq</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.7134</td>
<td>.5090</td>
<td>.2828</td>
<td>23.3236</td>
<td>2.0000</td>
<td>45.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

**Model**

<table>
<thead>
<tr>
<th>coeff</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant 4.7502</td>
<td>.3526</td>
<td>13.4736</td>
<td>.0000</td>
<td>4.0401</td>
<td>5.4603</td>
</tr>
<tr>
<td>DT -.0161</td>
<td>.0070</td>
<td>-2.3135</td>
<td>.0253</td>
<td>-.0301</td>
<td>-.0021</td>
</tr>
<tr>
<td>GHDiff -4.321</td>
<td>.0800</td>
<td>-5.4002</td>
<td>.0000</td>
<td>-.5932</td>
<td>-.2709</td>
</tr>
</tbody>
</table>

*************** DIRECT AND INDIRECT EFFECTS OF X ON Y ***************

**Direct effect of X on Y**

<table>
<thead>
<tr>
<th>Effect</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.0161</td>
<td>.0070</td>
<td>-2.3135</td>
<td>.0253</td>
<td>-.0301</td>
<td>-.0021</td>
</tr>
</tbody>
</table>

**Indirect effect(s) of X on Y:**

<table>
<thead>
<tr>
<th>Effect</th>
<th>BootSE</th>
<th>BootLLCI</th>
<th>BootULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHDiff</td>
<td>-.0116</td>
<td>.0066</td>
<td>-.0250</td>
</tr>
</tbody>
</table>

**Table 121**

*Distress Tolerance and Sleep Quality – Mediation by Perceived Importance*

**Model : 4**
PERSEVERANCE AND HEALTH BEHAVIORS

Y : PSQI Sleep Quality
X : Distress Tolerance (DT)
M : Sleep Importance (SlpImp)

OUTCOME VARIABLE:
PSQI Sleep Quality

Model Summary

<table>
<thead>
<tr>
<th>R</th>
<th>R-sq</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.4383</td>
<td>.1921</td>
<td>12.7454</td>
<td>5.3498</td>
<td>2.0000</td>
<td>45.0000</td>
<td>.0082</td>
</tr>
</tbody>
</table>

Model

coeff | se   | t    | p   | LLCI | ULCI |

constant | 12.4684 | 2.5589 | 4.8726 | .0000 | 7.3144 | 17.6223 |
DT | -.1235 | .0447 | -2.7598 | .0083 | -.2136 | -.0334 |
SlpImp | .7591 | .5361 | 1.4159 | .1637 | -.3207 | 1.8389 |

******************** DIRECT AND INDIRECT EFFECTS OF X ON Y **********************

Direct effect of X on Y

Effect | se   | t    | p    | LLCI | ULCI |

-.1235 | .0447 | -2.7598 | .0083 | -.2136 | -.0334 |

Indirect effect(s) of X on Y:

Effect | BootSE | BootLLCI | BootULCI |

SlpImp | -.0075 | .0127 | -.0346 | .0188 |

Table I22

Distress Tolerance and General Health Status – Mediation by Perceived Importance

Model : 4

Y : General Health Status
X : Distress Tolerance (DT)
M : General Health Importance (GH_Imp)

OUTCOME VARIABLE:
General Health Status

Model Summary

<table>
<thead>
<tr>
<th>R</th>
<th>R-sq</th>
<th>MSE</th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>.5976</td>
<td>.3571</td>
<td>.3703</td>
<td>12.4972</td>
<td>2.0000</td>
<td>45.0000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

Model

coeff | se   | t    | p   | LLCI | ULCI |

constant | 3.1088 | .4625 | 6.7215 | .0000 | 2.1772 | 4.0404 |
DT | -.0222 | .0077 | -2.8708 | .0062 | -.0378 | -.0066 |
GenHImp | .3676 | .1078 | 3.4118 | .0014 | .1506 | .5847 |

******************** DIRECT AND INDIRECT EFFECTS OF X ON Y **********************

Direct effect of X on Y

Effect | se   | t    | p    | LLCI | ULCI |

-.0222 | .0077 | -2.8708 | .0062 | -.0378 | -.0066 |

Indirect effect(s) of X on Y:

Effect | BootSE | BootLLCI | BootULCI |

GenHImp | -.0055 | .0038 | -.0137 | .0016 |