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Research Article

Validation of the Physical Health Questionnaire (PHQ) On Indian College Students

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ABSTRACT

The authors report the psychometric analysis of the Physical Health Questionnaire (PHQ). The main aim of this research was to examine the suitability of the PHQ on Indian college students. The PHQ is a shortened and modified version of the health scale developed by Spence et al. (1987). A revised and abbreviated (14-item) version of Spence et al. 's (1987) scale was used by Rogers and Kelloway (1997). In the present study PHQ is referred from Schat, Kelloway, and Desmarais (2005) paper and tested for psychometric analysis such as EFA and CFA. Data was collected from 101 participants, 50 Males, 51 Females from 18 to 23 years of age. The study showed a four-factor solution in PCA with 62.25 percent cumulative variance accounted for by four factors, with satisfactory internal consistency providing empirical evidence of convergent validity through the average variance extracted. Furthermore, a confirmatory factor analysis using maximum likelihood estimation supported the four-factor model, showing significant fit to the data and satisfactory additional fit indices.. This scale is established to be psychometrically suitable for use in the Indian contextand shows acceptable psychometric properties to use the tool for Indian Students. This scale is suitable for young adults and would provide valuable information about their well-being.

Keywords: physical health, somatic symptoms, validity, measurement, EFA, CFA

Introduction

Physical health relates to the overall wellness of the body. Mental health and social health are both embedded by physical health. The main keys of physical health involve physical exercise, healthy nutrition and healthy diet, alcohol intake, self-care management, rest, and sleep. The physical health of young adults is continuously decreasing. It is importantto effectively examine the physical health of the young generation. Such evaluations not only enhance physical fitness but also contribute to strengthen mental well-being among the youth.
A growing amount of research that demonstrates the connection between human psychological and physical health is available (go through, Cohen & Herbert, 1996; Herbert& Cohen, 1993; Kiecolt-Glaser & Glaser, 1988). Data from research has shown a link between human psychological and physical health, and this link is supported by science (gothrough, Cohen & Herbert, 1996; Herbert & Cohen, 1993). Numerous physical conditions and symptoms, including digestive disorders, cardiovascular disease, and upper respiratory infections, psychological functioning has been impacted, specially to stressful life situationsand managing emotional responses.
There has been a lot of study done on the potential links between psychological stress and physical sickness. Strong evidence supports the association between immunosuppression,or the reduction of immune function in response to stresses, and a person's vulnerability to infectious illnesses (Cohen, 1996). According to research (e.g., Cohen, 1996), being exposed to stimuli and experiencing negative emotional responses to them alter

hormonal and sympathetic nervous system responses, which in turn weaken the immune system.
There is enormous research material available on the effect of consistent stressful work culture on the health of employees. Research in this area has found connections between work-related stress and immune system suppression (O'Leary, 1990), an increased risk of infectious diseases (e.g., Cohen & Williamson, 1991), as well as musculoskeletal complaints (e.g., myalgia; Lundberg et al., 1999; see also Carayon, Smith, & Haims, 1999), higher fibrinogen levels in women (Davis, Matthews, Meilahn, The empirical research (e.g.,Ganster, Fox, & Dwyer, 2001; Manning, Jackson, & Fusilier, 1996) linking occupational stress to healthcare expenditures and use is not unexpected in light of these findings.
We focus on how physical health is built before talking about the problems with measuring it. We also explain how feelings like stress and emotions can affect physical health, but we don't go into detail about these issues in this study. Instead, if you are interested we suggest reading more detailed books or articles, like the ones by Cohen & Herbert (1996), Herbert & Cohen (1993), and Kiecolt-Glaser & Glaser (1988).
Human psychological and physical health are increasingly recognized to be linked, and there is a growing body of literature that scientifically supports this relationship (go through, see Cohen & Herbert, 1996; Herbert & Cohen, 1993). Many physical illnesses and symptoms, such as upper respiratory infections, digestive issues, and cardiovascular disease, have been related to psychological functioning, particularly exposure to stressful life experiences and emotional reactions to the same. Scientists have studied how emotions can affect an individual's physical health.
The relationship between immunosuppression, which is the inhibition of immune function in response to stressors, and an individual's susceptibility to infectious diseases isone for which there is strong evidence (Cohen,1996). Yet, as Cohen said, it is challenging to assemble convincing evidence of the processes by which stress affects the immune systemdue to the complexity of the immune system as well as the methodological restrictions placedon evaluating this complexity in human investigations. The research suggests that being exposed to stimuli and having a negative emotional reaction to them affect hormonal and sympathetic nervous system responses, which then damage the immune system (e.g., Cohen, 1996).
The literature on occupational health is one area where the link between stress and health has drawn a lot of attention. According to research in this field, being exposed to work-related stress is linked to immune system suppression (O'Leary, 1990), a higher risk of infectious diseases (e.g., Cohen & Williamson, 1991), as well as musculoskeletal complaints (e.g., myalgia; Lundberg et al., 1999; see also Carayon, Smith, & Haims, 1999), increased fibrinogen levels in women (Davis, Matthews, Meilahn, & Kiss, 1985), asthma, ulcers, and the risk of stroke (Quick, Quick, Nelson, & Hurrell, 2001). Based on these results, job stress and healthcare costs and utilization are correlated in the empirical evidence (e.g., Ganster, Fox, & Dwyer, 2001; Manning, Jackson, & Fusilier, 1996).
With reference, it is important to see how physical wellbeing is being measured andpsychometric properties across different cultural and social backgrounds. In this present research Physical well being scale by Schat, Kelloway, and Desmarais (2005) which measures the physical well being of young adults from India

Measuring Physical Health

Physical strain measurements have been used to examine a wide range of somatic symptoms, from relatively unimportant ones like insomnia, upper respiratory infections, anddigestive problems to potentially fatal ones like high blood pressure (Barling & Kelloway, 1996), hypertension (Schwartz, Pickering, & Landsbergis, 1996), and coronary heart disease(e.g., Spence et al., 1987). (1990) (Karasek & Theorell; Krantz, Contrada, Hill & Friedler, 1988). The Physical Symptoms Inventory, the Occupational Stress Indicator, and the Symptoms Checklist are additional self-report tools used to assess workplace stress in addition to the PHQ (Bartone, Ursano, Wright, & Ingraham, 1989). Despite the fact that many studies of job stress have included behavioral and physiological measures of somatic health.
The use of physical health measurements in occupational health research is common,but little in-depth study has been done on their validity, which is often just assessed to the level of internal consistency reliability. Given the predominance of self-report measures of job-related stresses and strains, Spector and Jex (1998) noted that it is "surprising that relatively little emphasis has been spent on showing construct validity of specific scales" (p.359). Why has validating physical health measurements received relatively little attention inthe literature? We offer two justifications for this. First, it would seem that construct validityis not given much consideration in the research of organizational behavior, which also includes the study of stress and strain at work (Schwab, 1980). Spector & Jex (1998), and self-reports (Evans & Johnson, 2000). Second, occupational health and job stress research seldom focuses on physical health; instead, it often uses strain as a stress outcome variable. Because of this, discussion of its measurement is typically quite brief and frequently only consists of a summary of the scale, along with information about its accuracy and internal consistency. Additionally, workplace violence and Type A behavior have been studied usingthe PHQ as an end measure (Spence et al., 1987; Rogers & Kelloway, 1997; Schat & Kelloway, 2000, 2003).
Since the year 2000, there have been various physical health measuring questionnairesused in research. Some notable examples include:

1. SF-36: The Short Form 36 (SF-36) is a commonly used questionnaire that evaluates overall health and quality of life. It has 36 items across eight domains, like as physicalfunctioning, role limitations due to physical health, pain, and vitality.
2. WHOQOL-BREF: The World Health Organization Quality of Life Brief (WHOQOL-BREF) a shortened version of the WHOQOL-100, measures quality oflife in four key areas: physical well-being, mental well-being, social relations, and environmental factors.
3. IPAQ: International Physical Activity Questionnaire (IPAQ) evaluates how much people are active and how much time they spend sitting idle. It focuses on differentaspects of physical activity, including exercise in free time, work-related activities,transportation, and household work.
4. PHQ-9: The Patient Health Questionnaire-9 (PHQ-9) is a tool individuals use to assess their depression symptoms based on nine questions about their feelings andexperiences over the past two weeks.
5. GAD-7: The Generalized Anxiety Disorder 7 (GAD-7) questionnaire is a concise screening tool for assessing anxiety symptoms. It includes seven items and it is alsoused to evaluate the severity of generalized anxiety disorder.

These questionnaires have been widely used in research to assess physical health, quality of life, physical activity levels, and mental health symptoms. Researchers works to develop and enhance these instruments to increase their accuracy and relevance in measuring physical health outcomes.

Physical health in early adulthood influences the quality of healthy life in the future.

Thus, it becomes important to validate measures of physical health. The physical health questionnaire was developed by Spence, Helmerich and Pred (1987) which originally has 32items. A revised scale carrying 14 items was developed by Rogers and Kelloway (1997).

Items 1 to 11 are rated measuring the frequency on a 7-point scale ranging from 1is (not at all) to 7 is (all the time). The items 12 to 14 are scaled on the frequency scale 0 times to 7 plus times. The respondents need to mark their experience about sleep disturbances, headaches, respiratory infections, and gastrointestinal problems they have been facing duringthe past. The young adults in the age group of 18 to 23 are tested to carry out factorial analysis.

Methods Participants

In this study, a sample of the Indian university students was taken through incidental sampling with help of google forms. Responses were collected from 101 participants; the age of the population is 18 to 23. All the participants were from various undergraduate programs from different universities across India.

Procedure

The revised Physical Health Questionnaire's applicability to the Indian population underwent expert examination. Since there are many different local languages and cultures in India, the language proficiency of the scale and its wordings were examined by a linguist to ensure that anyone with English language competence equivalent to the fifth grade may understand the questions being asked. The scale was adjusted to be fair across cultures. Google Form was created and distributed. Demographic information like names and contact information were not collected from respondents because the testing was anonymous. 100 percent of the total of the respondents were literate in English, both written and spoken. The first phase was gathering data, and the second was interpretation. The acquired data was also rated in accordance with the revised physical health questionnaire's instructions because the scale is evaluated on a Likert scale. The data was prepared for statistical analysis by cleaning it. The data was cleaned and scored using Microsoft Excel and subjected to data analysis.

Tool

We employed the PHQ which is a modified version of Spence et. al. (1987) healthcareto evaluate physical health. The scale had 14 items and asked respondents how frequently they had headaches, lung infections, gastrointestinal issues, and sleep disruptions. Item 1 to11 were rated on a 1 to 7 scale, and 1 rated the least and 7 rated the most often. Items 12 through 14 featured several frequency-related response choices.

Data Analysis

We used principal-components extraction and rotated the extracted factors to a varimax criterion to obtain an initial assessment of the factor structure of the PHQ. Then the obtained solution is then cross validated confirmatory factor analysis (CFA). This approach, in which EFA precedes CFA, is generally considered the most appropriate approach when a scale's factor structure is first being examined (Tabachnick & Fidell, 1996) and has been suggested as a viable strategy for theory development and analysis (Gerbing & Hamilton, 1996).

Results

Data were analyzed using SPSS version 25 for CFA JASP version 1.7. To test the internal consistency item total

correlation was tested, Cronbach's alpha was used to test thereliability of the scale. To test the validity principal component analysis was used and lastlyCFA was used to confirm the four factors solution established earlier.

Reliability analysis

In the present study, the reliability of the scale was tested and reported. Cronbach alpha calculated was .77 for all the items. The internal consistency of the scale was also tested with the help of the item-total correlations. It was found that each item was significantly correlated with the total score. The validity of the scale was also tested using theinternal consistency.

Factor analysis

First we verified the adequacy of using Principal Component Analysis (PCA) with theuse of the Kai- ser-Meyer-Olkin (KMO) criterion, and the Bartlett Sphericity Test ($\chi 2$) .

Recommended KMO values should be equal or above .60, and Bartlett chi-square test shouldbe statistically significant to support this type of statistical analysis (Tabachnick & Fidell, 2013). The PCA intended to check whether a general factor would emerge in the present study; component extraction was determined by Cattell's scree plot criteria. Finally, internalconsistency was estimated using Cronbach's alpha.

EFA with principal component extraction and varimax rotation, was performed usingSPSS 25 to evaluate the internal consistency of the scale as a whole and the dimensional weighting of the construct (Costello & Osborne, 2005). According to Pasquali (2008), the validity of the items that made up each factor was also analyzed, based on how well the statement represents the factor, that is, if the item has a high factor loading. After examiningthe (a) eigenvalues, (b) percentages of explained variance, (c) and factor structure as proposed by Hair, Black, Babin, Anderson, and Tatham, (2006) the final factor structures were chosen.

According to Comrey and Lee (1992) Items were rated on loadings from inadequate to good. Items with loadings at or above 0.32 were considered below standard, while those ator above 0.45 were seen as acceptable. Loadings of 0.55 or higher were classified as good,

0.63 or higher as very good, and 0.71 or higher as excellent. Items with loadings of 0.55 or higher were included for further statistical examination. Exploratory factor analysis (EFA) was calculated with principal component analysis. Rotated factor loading matrix was assessedand examined thoroughly. In the rotated factor pattern, items having factor loading equal or greater than 0.50 are generally considered as a part of the proposed dimension (Moore & Benbasat, 1991).

The PHQ Scale's principal component analysis was implemented for the four factors with eigenvalues greater than one (as shown in Figure 1). The total variance contributed in the factor solution is **62.248**. The KMO evaluates the sample adequacy, which must be near to 0.5 in order to successfully conduct factor analysis. According to Kaiser (1974), values forKMO should be at least 0.5 (just acceptable), between 0.7 and 0.8 (good), and above 0.9 (superb). The sample adequacy score calculated by Kaiser-Meyer-Olkin is **0.761** and Bartlett's test of Sphericity with significant chi-square ***χ2/91= 447.738 p< 0.001.***

The self-acceptance sexuality inventory's items collectively account for **70.501** percent of the variance. The communalities score ranges from .57 to .71. Rotated sums of squared loading were checked, first factor loading found 18.99 with highest loading. Secondfactor loaded 18.19 almost similar to first factor, 12.64 percent variance contributed by the third factor loading and lastly fourth factor contributed 12.42 percent of variance in total 62.24 percent rotation sums of squared loadings.

Table 2: Factor loadings

Items	Sleep Disturbance	Headaches	Gastrointestinal	Respiratory Problems	Infections
1.how often have you had difficulty getting sleep at night?	0.678				
2. how often have you woken up during the night?	0.773				
3. how often have you had night mares or disturbing dreams?	0.509				
4. how often has your sleep been peaceful and undisturbed?	0.589				
5. how often have you experienced headaches		0.412			
6. how often did you get a headache when there was a pressure on you to getting		0.970			
7.How often did you get a headache when you were frustrated because things we		0.630			
8.how often have you suffered from an upset stomach indigestion			0.746		
9.how often did you have to watch that you			0.505		

ate carefully to avoid stomach upse				
@10howoftendidyoufeelnauseatedsicktoyourownstomach			0.582	
@11howoftenwereyouconstipatedordidyousufferfromdiarrhea			0.449	
@12howmanytimeshaveyouhadminorcoldsthatmadeyoufeeluncomfortableb				0.658
@13howmanytimeshaveyouhadrespiratoryinfectionsmoreseverethanmino				0.454
@14whenyouhadabadcoldorfluhowlongdidittypicallylast				0.476
Note. Applied rotation method is varimax.				

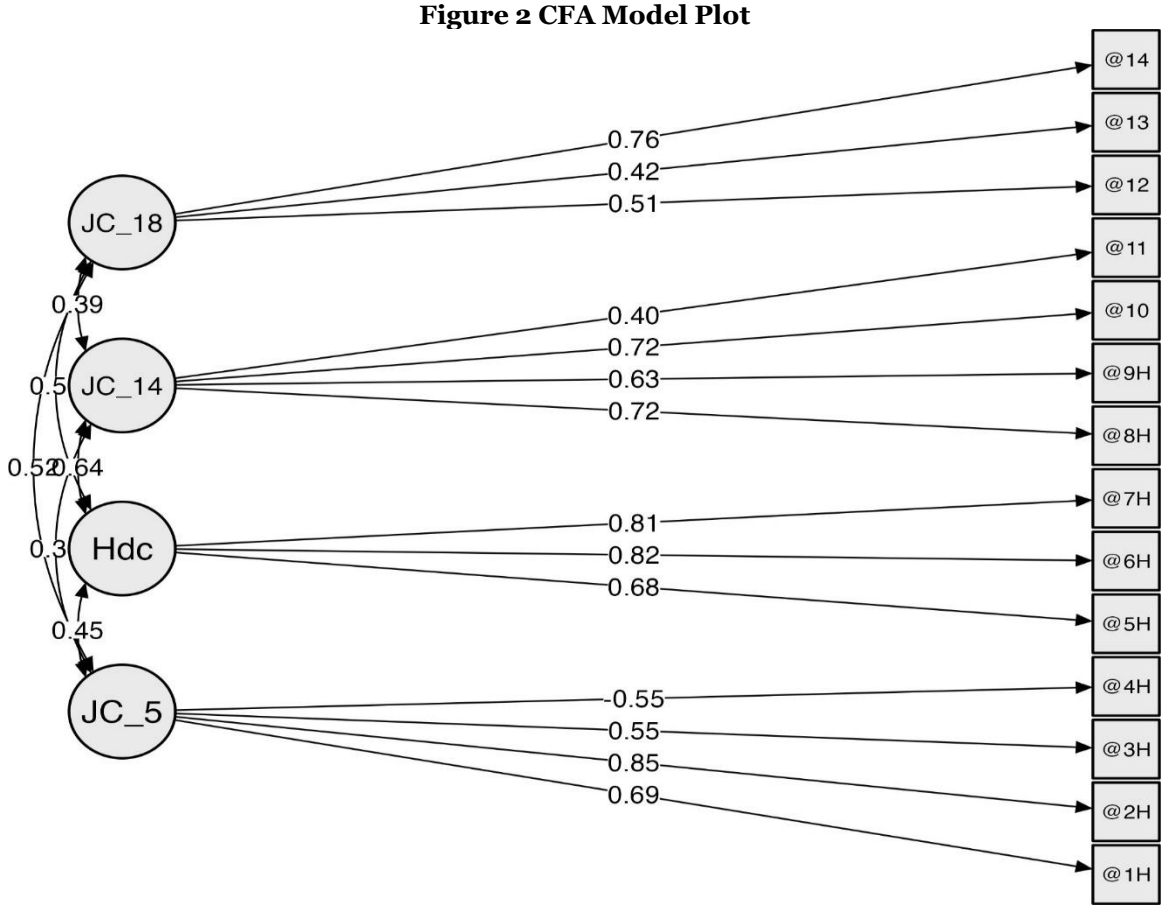
The researchers were able to determine on the basis of earlier literature and findings of the PCA, that the Students Life Satisfaction Scale consisted of two dimensions with a total of seven items. Factor I Satisfaction with Life five items and Factor II Dissatisfaction with Lifetwo items.

Confirmatory Factor Analysis

By total sample and gender, Five goodness-of-fit indices were calculated in order to assess global fit of the model. Various measures such as χ2, χ2/df, GFI, adjusted GFI, CFI, and RMSEA are used to evaluate how a statistical model aligns with observed variables. A significant χ2 value indicates that the proposed model does not fit the observed data well. Additional metrics like GFI offer insight into the extent to which the model explains the variance and covariance among observed variables. The GFI value ranges from 0 to 1, with a value of 1 indicating a perfect fit between the model and the data. CFI compares the fit of a null model (i.e., when unobserved variables are uncorrelated and independent) with the fit of the researcher's model (Babyak M, Green S., 2010). A CFI value of greater than 0.90 shows a psychometrically acceptable fit to the data (Tabachnick B, Fidell L.2007). RMSEA, a quantitative measure, indicates the degree to which the model aligns with the observed data. An RMSEA value below 0.05 signifies a strong fit between the model and the data. The mainresults of this model are shown in Figure 2.

To extend our investigation of the efficacy of the PHQ. We conducted a CFA to examine stability of the factor structure we established in EFA and to match the pattern of results that emerged from the EFA. We hypothesized that Each PHQ item will be significantly linked to one of the four aspects of somatic health.

Figure 2 CFA Model Plot



The following indexes of fit were established by the ML estimator: $\chi 2$ *(71)* = 102.162, $p <$ .005, *GFI* = .978, *CFI* = .920, *TLI* = .897, SRMR = .06, and *RMSEA* = .06 (IC 90% = .034–.093), the CFI and TLI matches the recommended values. It is important to note that all the factorial weights (lambdas) were significant at .01 level for all the items, means were statistically different from zero ($\lambda \neq 0$; $z > 2.58$, $p < .001$). The four factors also showed goodcoefficient of internal consistency ($\alpha = .765$, $\omega = .788$).

Discussion:

This study was carried out as an initial step in the validation of the PHQ and involved assessing its factor structure and internal consistency reliability. The process of validation involves collecting evidence for the measurement of the properties of the scale including Face validity, Construct Validity, Criterion Validity and reliability and responsiveness. Apart from the variables mentioned in the literature review of various health scales, the PHQ also aimed to measure the effects on Respiratory Illness factor of Physical Health which was rarely considered before. The results of the EFA supported the hypothesized four-dimensional conceptualization corresponding to the dimensions of physical health that constituted the original scale (Spence et al., 1987). Specifically, the results showed that the PHQ is composed of four factors representing the following four types of physical symptoms: Gastrointestinal Problems, Headaches, Sleep Disturbances, and Respiratory Infections. The EFA solution showed that the factors were empirically distinguishable and accounted for substantial amounts of item variance. In addition, the PHQ dimensions demonstrated acceptable levels of internal consistency reliability.

The EFA results were conducted on 101 Indian university students. This was done through incidental sampling and the reason to choose this sample was to validate the scale on Indian population. According to a study almost 20% to 37% Indians are not active or mildly active and 57% of the population does not meet the physical health regimen proposed by the WorldHealth Organization. Validating the scale can be used as evidence to develop strategic outcomes for reducing the prevalence of physical inactivity. Further the robustness and generalizability of the undergraduate students also provided evidence for the construct validity. However, there is also scope for this scale to be validated on other populations as well and is equivalent for both men and women.

WHO declared the covid pandemic on March 11,2020. This pandemic caused a drastic change in people's lives globally physically and mentally. This pandemic led to a sudden halt to outdoor physical activity putting them at the risk of many chronic diseases. Overcoming this was no less than a challenge for many. According to a report, covid had anoverall negative impact on physical health. The results showed that the pandemic led to considerable decline in the percentage of mobility, walking and physical activity and a significant increase in sedentary activities. Housing and neighborhood environments have also been said to have played an important role with some evidence also suggesting its role inreducing the impact of the pandemic.

Furthermore, the pandemic caused severe damage to the organs like kidney, skin, brain and heart which were also fatal making it more important to look at physical health from a more holistic and sensitive view. Boosting the immune system of individuals became an importantpart of the after effects of covid-19 for which tracking the physical health of individuals is ofutmost priority. Apart from this the mental effect of the disease affected people for more than2 years causing the stress to be manifested in physical form.

Importance of the four factors

We also emphasize the importance of the four factors of the PHQ scale- sleep disturbance, headaches, gastrointestinal problems and respiratory illness. There is sufficient evidence suggesting that these factors contribute a great deal towards Physical health. Physical activityhas shown a promising effect on managing sleep related issues such as insomnia. Exercise is said to be a behavioral sleep medicine and is recommended as an alternative to therapies for problems regarding sleep. Similarly physical activity is said to help with gastrointestinal problems and help in reducing the risk of colon cancer, constipation and nausea. All other forms of activity including yoga and stretching have also been said to help with irritable bowel syndrome (IBS). Another benefit of physical activity is to reduce the frequency of headaches. One study foundthat higher levels of physical activity during leisure time is associated with fewer migraines and tension-type and fewer headache attacks. Physical activity is said to release endorphins acting like natural painkillers helping to reduce headaches. Exercise can help with various respiratory illnesses and make you feel better by opening your nasal passages and temporarilyrelieving nasal congestion. Exercise is also said to help with a runny nose, sore throat and sneezing.

Challenges of the scale, having said that, the PHQ also faces some challenges. These challenges provide scope for further research and to make better choices about methodological strategies. The PHQ scale fails to measure the intensity of the Physical activity that has an effect on the four factors. Most times the level of activity combined with high levels of stress can have adverse effects on health. Moderate and mild activity is fine when you have a common cold but physical activity can further hamper health if a person hashigh fever or high levels of stress. Another challenge that the PHQ scale faces is that the answers provided are based on the perceived interpretation of the participant. The questionnaire does not offer a particular timeline on which the data should be based. Thismay cause a recency bias about the current health status of the participant.

Based on the existing knowledge gaps, further studies utilizing more vigorous sampling strategies and objective

measures of physical activity can be used to increase the generalizability of the study. Moreover, further research as mentioned can be done on vulnerable populations (eg working population, geriatric).
Given the significance of tracking Physical health in maintaining and promoting health behaviors and health outcomes and with considerable evidence based on covid-19, studies can further explore the mind body connection and its effect on physical health in detail.
The reviews used as supporting the study consisted of research and articles published only in English as none of the authors were fluent in any other foreign language. Further studies can also take in other international publications to further better support their research.
The PHQ scale serves as an important tool in many ways. They are one of the most feasible methods that accurately measure the physical health symptoms on a large sample that is measuring the relationship between physical activity and health. This tool can effectively be used in schools and colleges to effectively assess the well-being of students across physical activity, diet, sleep and mental health. Tracking of the physical health symptoms can also be used in a lot of medical research for the prevention of the development of illness.
Together, the results of EFA and internal consistency provide preliminary construct validity evidence for the PHQ. However, these results are only preliminary, and additional evidence of model stability was established with CFA. All the indices were at the acceptable range and similar four factor models were replicated.

Conclusion:

This research was undertaken to evaluate the structure and psychometric properties of the PHQ. The factor analysis results converged in suggesting that a model consisting of four first-order factors composed of Gastrointestinal Problems, Headaches, Sleep Disturbances, and Respiratory Illness.

References

1. Hernandez, R., Bassett, S. M., Boughton, S. W., Schuette, S. A., Shiu, E. W., & Moskowitz, J. T. (2018). Psychological Well-Being and Physical Health: Associations, Mechanisms, and Future Directions. Emotion Review, 10(1), 18-29. https://doi.org/10.1177/1754073917697824
2. H. Mönnikes, J.J. Tebbe, M. Hildebrandt, P. Arck, E. Osmanoglou, M. Rose, B. Klapp, B.Wiedenmann, I. Heymann-Mönnikes; Role of Stress in Functional Gastrointestinal Disorders : Evidence for Stress-Induced Alterations in Gastrointestinal Motility and Sensitivity. Dig Dis 1 July 2001; 19 (3): 201–211. https://doi.org/10.1159/000050681
3. Dimsdale, J. Psychological Stress and Cardiovascular Disease. J Am Coll Cardiol. 2008Apr, 51 (13) 1237–1246.https://doi.org/10.1016/j.jacc.2007.12.024
4. Pedersen, Anette PhD; Zachariae, Robert DMSci; Bovbjerg, Dana H. PhD. Influence ofPsychological Stress on Upper Respiratory Infection—A Meta-Analysis of Prospective Studies. Psychosomatic Medicine 72(8):p 823-832, October 2010. | DOI: 10.1097/PSY.0b013e3181f1d003
5. Padgett, David A; Glasser, Ronald. How stress influences the immune response VOLUME24, ISSUE 8, P444-448, AUGUST 2003. https://doi.org/10.1016/S1471-4906(03)00173-X
6. Dahlgren, A., Kecklund, G., & Åkerstedt, T. (2005). Different levels of work-related stressand the effects on sleep, fatigue and cortisol. Scandinavian Journal of Work, Environment & Health, 31(4), 277–285. http://www.jstor.org/stable/40967503
7. Nakata, A. (2012). Psychosocial Job Stress and Immunity: A Systematic Review. In: Yan,
Q. (eds) Psychoneuroimmunology. Methods in Molecular Biology, vol 934. Humana Press, Totowa, NJ. https://doi.org/10.1007/978-1-62703-071-7_3
8. Lins L, Carvalho FM. SF-36 total score as a single measure of health-related quality oflife: Scoping review. SAGE Open Med. 2016 Oct 4;4:2050312116671725. doi: 10.1177/2050312116671725. PMID: 27757230; PMCID: PMC5052926.
9. Vahedi S. World Health Organization Quality-of-Life Scale (WHOQOL-BREF): Analysesof Their Item Response Theory Properties Based on the Graded Responses Model. Iran J Psychiatry. 2010 Fall;5(4):140-53. PMID: 22952508; PMCID: PMC3395923.
10. Lee, P.H., Macfarlane, D.J., Lam, T. et al. Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. Int J Behav Nutr Phys Act 8, 115 (2011). https://doi.org/10.1186/1479-5868-8-115
11. Laura Manea, Simon Gilbody, Dean McMillan,A diagnostic meta-analysis of the Patient Health Questionnaire-9 (PHQ-9) algorithm scoring method as a screen for depression,General Hospital Psychiatry, Volume 37, Issue 1, 2015, Pages 67-75, ISSN 0163-8343, https://doi.org/10.1016/j.genhosppsych.2014.09.009.
12. Mossman SA, Luft MJ, Schroeder HK, Varney ST, Fleck DE, Barzman DH, Gilman R, DelBello MP, Strawn JR. The Generalized Anxiety Disorder 7-item scale in adolescents withgeneralized anxiety disorder: Signal detection and validation. Ann Clin Psychiatry. 2017 Nov;29(4):227-234A. PMID: 29069107; PMCID: PMC5765270.
13. Schat, Aaron & Kelloway, Kevin & Desmarais, Serge. (2005). The Physical Health Questionnaire (PHQ):

Construct Validation of a Self-Report Scale of Somatic Symptoms. Journal of occupational health psychology. 10. 363-81. 10.1037/1076-8998.10.4.363.
14. Podder V, Nagarathna R, Anand A, Patil SS, Singh AK, Nagendra HR. Physical ActivityPatterns in India Stratified by Zones, Age, Region, BMI and Implications for COVID-19: A Nationwide Study. Ann Neurosci. 2020 Jul;27(3-4):193-203. doi: 10.1177/0972753121998507. Epub 2021 May 12. PMID: 34556960; PMCID: PMC8455010.
15. Park AH, Zhong S, Yang H, Jeong J, Lee C. Impact of COVID-19 on physical activity: Arapid review. J Glob Health. 2022 Apr 30;12:05003. doi: 10.7189/jogh.12.05003. PMID: 35493780; PMCID: PMC8979477.
16. Jain U. Effect of COVID-19 on the Organs. Cureus. 2020 Aug 3;12(8):e9540. doi:10.7759/cureus.9540. PMID: 32905500; PMCID: PMC7470660.
17. Attia M, Ibrahim FA, Elsady MA, Khorkhash MK, Rizk MA, Shah J, Amer SA. Cognitive, emotional, physical, and behavioral stress-related symptoms and coping strategiesamong university students during the third wave of COVID-19 pandemic. Front Psychiatry.
2022 Sep 16;13:933981. doi: 10.3389/fpsyt.2022.933981. PMID: 36186888; PMCID:PMC9523087.
18. Stein, Murray B. MD, MPH; Belik, Shay-Lee MSc; Jacobi, Frank PhD; Sareen, Jitender MD. Impairment Associated With Sleep Problems in the Community: Relationship to Physical and Mental Health Comorbidity. Psychosomatic Medicine 70(8):p 913-919, October 2008. | DOI: 10.1097/PSY.0b013e3181871405
19. Krøll, L.S., Hammarlund, C.S., Westergaard, M.L. et al. Level of physical activity,
well-being, stress and self-rated health in persons with migraine and co-existing tension-typeheadache and neck pain. J Headache Pain 18, 46 (2017).
https://doi.org/10.1186/s10194-017-0753-y
20. Oliveira AB, Mercante JPP, Peres MFP, Molina MDCB, Lotufo PA, Benseñor IM,Goulart AC. Physical inactivity and headache disorders: Cross-sectional analysis in theBrazilian Longitudinal Study of Adult Health (ELSA-Brasil). Cephalalgia. 2021 Dec;41(14):1467-1485. doi: 10.1177/03331024211029217. Epub 2021 Aug 18. PMID:34407642.