Initial Assessment of a Brief Health, Fitness, and Spirituality Survey for Epidemiological Research: A Pilot Study

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Background: Not many population-based health studies include items to assess both fitness and spirituality concepts. Therefore, the purpose of this study was to examine initial data of a brief health, fitness, and spirituality survey for epidemiological research.

Methods: This first phase pilot study used data from N = 56 adults 18+ years of age via electronic questionnaire. Measures of general health, fitness, physical activity (PA), body mass index (BMI), religiosity, and happiness were assessed. Reliability analyses were employed for PA, religiosity, and happiness scales. Validity coefficients were computed to evaluate convergence between scale scores and related measures. Finally, difference in health was examined between different levels of fitness to evaluate known groups discrimination.

Results: Respondents were middle-aged (Mean = 50.5 yr, SD = 14.3), majority white (69.5%, SD = 6.2), with relatively low BMI (Mean = 25.3, SD = 5.3). All three scales showed internal consistency reliability of $\alpha = 0.93$, $\alpha = 0.89$, and KR-20 = 0.56 for religiosity, happiness, and PA, respectively. Furthermore, scores converged (ps < 0.05) between fitness and PA (r = 0.43), health (r = 0.66), BMI (r = -0.28), and happiness (r = 0.25). Finally, health scores were significantly greater for high fitness versus low fitness in both male (p < 0.001) and female (p = 0.015) populations.

Conclusion: Results from this study indicate that a brief health, fitness, and spirituality survey can reliably measure its intended traits. A single-item of self-assessed fitness in particular has promise for large scale epidemiological research.

Key Words: Fitness, Physical activity, Spirituality, Happiness, Epidemiology

INTRODUCTION

Population-based research has for long assessed health

status and health behavior using questionnaire items administered to participants. Popular epidemiologic-based cohort studies such as the Physicians' Health Study, Framingham Heart Study, and Aerobics Center Longitudinal Study have used batteries of questionnaires to assess various health measures predictive of quality of life and longevity [1-3]. In large scale studies, where efficiency is a concern, shorter instruments with acceptable psychometric properties are preferred [4]. In particular, studies that cross-sectionally and continually survey populations for establishing prevalence estimates, trends, and associations often assess several different

health domains and therefore require questionnaires with fewer items per measure [5]. For example, the National Health and Nutrition Examination Survey (NHANES) assesses several different health factors via questionnaire such as diet, body measures, physical activity (PA), smoking, chronic disease, mental health, and health-related quality of life (HRQOL) with a minimal number of items [6]. In 2020, the Behavioral Risk Factor Surveillance System (BRFSS) assessed several health perceptions, conditions, and behaviors in adults using self-reported questions and used only a single item to assess PA [7].

Although several surveys exist that attempt to measure health-related predictors and outcomes for research purposes, few include self-assessed fitness. Physical fitness is a strong predictor of health and mortality and is typically assessed using time consuming and expensive laboratory techniques [8,9]. However, less burdensome estimates of fitness have been used successfully in research and could provide a more efficient means [10]. Additionally, few epidemiological surveys include spirituality measures, such as religiosity. Spirituality can be broadly defined as the passage people take to discover and fulfill their essential selves and higher order ambitions [11]. Religiosity, a more specific form of spirituality, can be defined as a belief in a greater power performed in ritualized ways [12]. Although few studies have examined both spirituality and religiosity in relation to health outcomes, even fewer have used validated scales along with other health measures for large scale research [13,14]. Therefore, the aim of this study was to examine initial data of a brief health, fitness, and spirituality (HFS) survey to be used in epidemiological research.

MATERIALS AND METHOD

1. Study design

Data for this research came from a first phase pilot study where data is being collected for a larger second phase advanced measurement assessment. The current study consists primarily of classical test theory methods whereas a future study will employ modern psychometric techniques. Participants were recruited by electronic mail from random university/academic institution directories. If agreeing to participate, respondents clicked on the electronic link provided which

took them to a *Google Forms* questionnaire [15]. A total of 19 items were included in the questionnaire and comprised measures of self-assessed general health (health) (1 item), self-assessed fitness (fitness) (1 item), physical activity (PA) (3 items), body mass index (BMI) (2 items), religiosity (5 items), happiness (4 items), and age, race, sex covariates (3 items). For this study, 56 adult respondents 18+ years of age with complete data were included.

2. Assessment of Health and Fitness

Health was assessed in this study using the following single item from NHANES: "Would you say your health in general is?" [16]. Available responses included "Excellent", "Very good", "Good", "Fair", or "Poor". For this study, a health score was created ranging from 1 to 5, where a higher score indicated better self-assessed health. Similar single health items have been used widespread in epidemiological research and shown to have acceptable psychometric properties [17]. Fitness was also assessed in this study using a single item which is known to be valid in estimating maximal oxygen consumption [18,19]. The fitness item asked participants "How do you rate your own physical fitness?". Available responses included "Very good", "Good", "Fair", "Poor", or "Very poor". For this study, a fitness score was created ranging from 1 to 5, where a higher score indicated better self-assessed fitness. Additionally, for comparison analyses, "High" ("Very good" and "Good") and "Low" ("Fair", "Poor", and "Very poor") fitness groups were created.

3. Assessment of PA

PA was assessed with a three-item scale modified from the NHANES PA questionnaire module [20]. The first question asked about vigorous-intensity PA, specifically, "In a typical week, do you do any vigorous-intensity sports, fitness, or recreational activities that cause large increases in breathing or heart rate like running or basketball for at least 10 minutes continuously?". The second question asked about moderate-intensity PA, specially, "In a typical week, do you do any moderate-intensity sports, fitness, or recreational activities that cause a small increase in breathing or heart rate such as brisk walking, bicycling, swimming, or volleyball for at least 10 minutes continuously?". The third question asked about muscle-strengthening activity (MSA), specifically,

"Do you regularly engage in muscle strengthening activity (such as push-ups, sit-ups, yoga or weight lifting) as a form of exercise?". Those responding "yes" to each PA item received an item score of '1' and those responding "no" received a '0'. The sum of the three items served as the PA score for this study, ranging from 0 to 3.

4. Assessment of Religiosity

The main measure of spirituality used in this study was religiosity, assessed using the Duke University Religion Index (DUREL) [21]. The DUREL is a five-item scale that measures three main subconstructs of religiosity. The organizational religious activity (ORA) construct measures public religious activities in group settings. The non-organizational religious activity (NORA) construct measures religious activities outside of public and group settings. The intrinsic religiosity (IR) construct measures personal commitment to religion. Supplementary Table 1 contains the DUREL as administered to participants in this study. A total religiosity score as well as three subscale scores were created by summing. The DUREL has shown adequate psychometric properties for research purposes [22].

5. Assessment of Happiness

A measure of happiness was used in this study as a known correlate to both spirituality and health [23,24]. Happiness was assessed using the Subjective Happiness Scale (SHS), a four-item scale measuring general happiness from intrinsic and relative perspectives [25]. Supplementary Table 2 contains the SHS as administered to participants in this study. A single happiness score was created by summing, with item 4 reverse scored first. The SHS has shown to be valid and reliable across several different populations [25,26].

6. Assessment of BMI and covariates

BMI (kg/m^2) was assessed in this study using self-reported height (in) and weight (lb). The English conversion formula of BMI = weight (lb)/height $(in)^2 \times 703$ was used to convert BMI to kg/m^2 [27]. Age was assessed using grouped categories of "18 to 24", "25 to 34", "35 to 44", "45 to 54", "55 to 64", "65 to 74", and "75+" years. For descriptive comparisons, a numeric measure of age was computed using category midpoints. Finally, participant sex and race were assessed using conventional survey questions.

Table 1. Descriptive statistics for Health, Fitness, and Spirituality (HFS) pilot study variables in a convenience sample of adults

Variable	Overall (N = 56)		Male (n = 30)		Female (n = 26)		Sex Diff
	Mean	SD	Mean	SD	Mean	SD	p–value
Age (yr)	50.5	14.25	54.7	14.30	45.5	12.73	0.015*
White race (%)	69.6	6.20	73.3	8.15	65.4	9.41	0.519
Height (in)	66.8	5.95	68.7	5.95	64.6	5.23	0.009*
Weight (lb)	162.9	45.43	174.7	42.89	149.3	45.27	0.036*
BMI (kg/m^2)	25.3	5.34	25.7	4.47	24.9	6.25	0.572
Health (1 thru 5)	3.4	0.76	3.4	0.77	3.5	0.76	0.892
PA (0 thru 3)	2.0	0.95	2.3	0.95	1.7	0.85	0.010*
Fitness (1 thru 5)	3.8	0.89	3.9	0.78	3.6	0.99	0.138
Religiosity (5 thru 27)	14.9	7.67	14.7	8.35	15.1	6.96	0.842
ORA (1 thru 6)	2.9	1.78	3.0	1.83	2.8	1.76	0.803
NORA (1 thru 6)	3.0	2.13	3.0	2.14	3.0	2.16	0.901
IR (3 thru 15)	9.0	4.32	8.7	4.75	9.3	3.82	0.604
Happiness (4 thru 28)	20.7	4.84	21.3	4.85	20.0	4.82	0.306

A numeric variable for Age was created by assigning midpoints from reported age groups. BMI is body mass index. Fitness is self-rated fitness by single-item. PA is a measure of physical activity from three NHANES items indicating participation in moderate-intensity PA, vigorous-intensity PA, and muscle strengthening activity. Health is a self-rated general health item from NHANES. Religiosity is a total score from the Duke University Religion Index (DUREL). ORA is a DUREL subscale of organizational religious activities. NORA is a DUREL subscale of non-organizational religious activities. IR is a DUREL subscale of intrinsic religiosity. Happiness is a total score from the Subjective Happiness Scale (SHS). Both independent t-test and Wilcoxon two-sample test were employed with same results and so t test p-values are reported. All variances were significantly equal (F statistic ps > 0.05). White race sex diff test is Pearson chi-square test of independence. p-values with * are significant (p < 0.05).

7. Statistical analyses

Descriptive statistics, with means and standard deviations, were first examined along with comparisons by sex. Scale reliability procedures included Cronbach alpha (α) and alpha with item deleted or the Kuder-Richardson-20 (KR-20) equivalent for binary response items [28]. Item correlations with scale scores (r_{Score}) and inter-item correlations (rs) were also computed. Additional scale validation included bivariate correlation coefficients (rs), evaluating convergence between scale scores and related measures. Finally, difference in health was examined between different levels of fitness to evaluate known groups discrimination [29]. Due to the ordinal nature and slight skewness of some variables, analogous nonparametric tests were also run. In all cases, results were the same, and so the parametric statistics and p-values were reported. Additionally, all tests of differences used the pooled variance statistics, since variances were equal. All analyses were performed using SAS version 9.4 [30]. Significance was defined as $p < 0.05$.

RESULTS

Table 1 contains descriptive statistics for all study variables, overall and by sex. Overall, respondents were middle-aged (Mean = 50.5 yr, SD = 14.3), majority white (69.5%, SD = 6.2), with relatively lower BMI (Mean = 25.3 yr, SD = 5.3). For sex differences, males were significantly ($p < 0.05$) older (Mean = 54.7 yr vs. Mean = 45.5 yr, p = 0.015) with greater PA (Mean = 2.3 vs. Mean = 1.7, p = 0.010). Table 2 contains reliability statistics for the PA scale. Internal consistency reliability was KR-20 = 0.56 for the three-item scale with no item deleted coefficients standing out as problematic. Furthermore, item-score correlations ranged from r_{Score}: 0.51 to 0.84. and inter-item correlations ranged from r: 0.15 to 0.84.

Table 2. PA scale reliability statistics for Health, Fitness, and Spirituality (HFS) pilot study variables in a convenience sample of adults (N = 56)

Item	Mean	SD	r_{Score}	VPA	MPA	MSA
VPA	0.518	0.504	0.794	1.000	0.149	0.427
MPA	0.929	0.260	0.514	0.149	1.000	0.309
MSA	0.554	0.502	0.836	0.427	0.309	1.000
KR-20	0.557		KR-20$_{Deleted}$	0.472	0.599	0.259

r_{Score} is respective item correlation with the scale score. KR-20 is overall internal consistency reliability for binary responses. KR-20$_{Deleted}$ is KR-20 with respective item deleted. VPA is vigorous-intensity PA. MPA is moderate-intensity PA. MSA is muscle strengthening activity.

Table 4. Happiness scale reliability statistics for Health, Fitness, and Spirituality (HFS) pilot study variables in a convenience sample of adults (N = 56)

Item	Mean	SD	r_{Score}	SHS1	SHS2	SHS3	SHS4
SHS1	5.446	1.306	0.906	1.000	0.811	0.840	0.530
SHS2	5.214	1.246	0.868	0.811	1.000	0.743	0.507
SHS3	5.000	1.375	0.893	0.840	0.743	1.000	0.538
SHS4	5.018	1.721	0.782	0.530	0.507	0.538	1.000
α	0.887		$\alpha_{Deleted}$	0.815	0.840	0.828	0.922

r_{Score} is respective item correlation with the scale score. α is overall internal consistency reliability. $\alpha_{Deleted}$ is α with respective item deleted. SHS1 thru SHS4 are Subjective Happiness Scale items.

Table 3. Religiosity scale reliability statistics for Health, Fitness, and Spirituality (HFS) pilot study variables in a convenience sample of adults (N = 56)

Item	Mean	SD	r_{Score}	ORA	NORA	IR1	IR2	IR3
ORA	2.911	1.781	0.878	1.000	0.713	0.688	0.739	0.738
NORA	3.000	2.132	0.896	0.713	1.000	0.683	0.763	0.747
IR1	3.214	1.648	0.846	0.688	0.683	1.000	0.703	0.688
IR2	3.018	1.519	0.904	0.739	0.763	0.703	1.000	0.824
IR3	2.750	1.587	0.897	0.738	0.747	0.688	0.824	1.000
α	0.931		$\alpha_{Deleted}$	0.917	0.915	0.925	0.907	0.909

r_{Score} is respective item correlation with the scale score. α is overall internal consistency reliability. $\alpha_{Deleted}$ is α with respective item deleted. ORA is organizational religious activities item. NORA is non-organizational religious activities item. IR1 thru IR3 are intrinsic religiosity items. IR subscale α = 0.894.

Table 5. Correlation coefficients for Health, Fitness, and Spirituality (HFS) pilot study variables in a convenience sample of adults

Variable	BMI	Health	PA	Fitness	Religiosity	ORA	NORA	IR	Happiness
BMI	1.000	−0.185	0.049	−0.275*	0.050	0.061	0.078	0.024	−0.052
Health	−0.185	1.000	0.175	0.663*	−0.045	−0.091	−0.045	−0.020	0.484*
PA	0.049	0.175	1.000	0.426*	−0.187	−0.182	−0.125	−0.194	0.118
Fitness	−0.275*	0.663*	0.426*	1.000	−0.126	−0.139	−0.086	−0.124	0.251
Religiosity	0.050	−0.045	−0.187	−0.126	1.000	0.878	0.896	0.971	0.187
ORA	0.061	−0.091	−0.182	−0.139	0.878	1.000	0.713	0.794	0.231*
NORA	0.078	−0.045	−0.125	−0.086	0.896	0.713	1.000	0.804	0.130
IR	0.024	−0.020	−0.194	−0.124	0.971	0.794	0.804	1.000	0.173
Happiness	−0.052	0.484*	0.118	0.251*	0.187	0.231*	0.130	0.173	1.000

Both Pearson and Spearman correlation coefficients were computed with same results and so Pearson values are reported. Values with * are significant ($p < 0.05$).

Table 3 contains reliability statistics for the DUREL scale with internal consistency reliability of $\alpha = 0.93$ for the five-item scale and no item deleted coefficients standing out as problematic. Additionally, item-score correlations ranged from r_{Score}: 0.85 to 0.90. And inter-item correlations ranged from r: 0.69 to 0.82. Table 4 contains reliability statistics for the SHS scale with internal consistency reliability of $\alpha = 0.89$ for the four-item scale and no item deleted coefficients standing out as problematic. As well, item-score correlations ranged from r_{Score}: 0.78 to 0.87. And inter-item correlations ranged from r: 0.51 to 0.84.

Table 5 displays convergent validity coefficients between scale scores and related measures. Most noteworthy, scores correlated significantly ($p < 0.05$) between fitness and PA (r = 0.43), fitness and health (r = 0.66), fitness and BMI (r = -0.28), and fitness and happiness (r = 0.25). Lastly, figure 1 displays mean health scores by high/low fitness group and by sex. The graph indicates health scores were significantly greater for high fitness versus low fitness in both male (Mean = 3.7 vs. Mean = 2.63, p < 0.001) and female (Mean = 3.8 vs. Mean = 3.1, p = 0.015) populations.

DISCUSSION

The purpose of this study was to examine initial pilot data from a brief health, fitness, and spirituality (HFS) survey to be used in epidemiological research. Specifically, the HFS survey was examined for its ability to function as an electronic health questionnaire administered to adult populations and measure its intended constructs. Results of the reli-
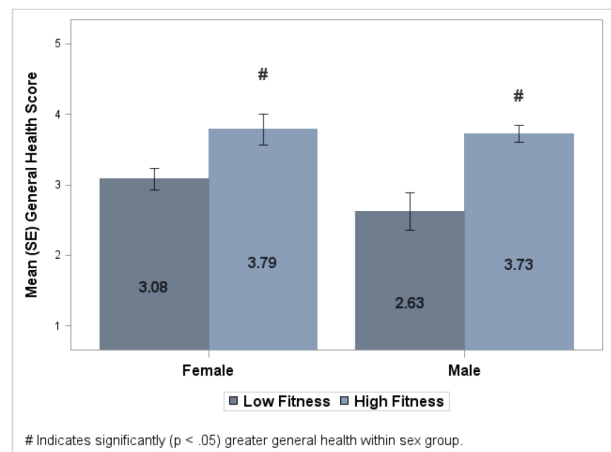

# Indicates significantly (p < .05) greater general health within sex group.

Fig. 1. Graph of health score means by fitness level and by sex for the Health, Fitness, and Spirituality (HFS) pilot study.

ability analyses clearly indicate the HFS survey has acceptable internal consistency among scale items for religion and happiness (i.e., $\alpha > 0.80$). Although the PA scale showed only a moderate reliability coefficient (i.e., KR-20 = 0.56), this may be due to the relatively small samples (N = 56) with only three items [31]. Therefore, the happiness, spirituality, and PA scales of the HFS may be considered sufficiently reliable in adult populations. Furthermore, the measures assessed in the HFS survey showed adequate convergence where expected. For example, the measure of self-assessed fitness correlated directly with PA and health and indirectly with BMI. This evidence supports the use of a single-item fitness measure. Similarly, the subjective happiness measure used in this study correlated directly with health, fitness, and the ORA subscale of the DUREL.

Happiness as a correlate to health and fitness has been seen in other research [32,33]. However, the inconsistent findings of happiness lacking overall religiosity, NORA and IR correlation but supporting ORA correlation was unanticipated. This may in part be due to the relatively small sample size and low power of the current study. This may also be due to a socialization connection with happiness, since the ORA subscale measures religious activities experienced in group settings [34,35]. Therefore, future research examining the different subdomains of spirituality in relation to happiness, with larger samples, is necessary.

This study does have limitations worth mentioning. One, the sample used in this was a convenience sample recruited from random university/academic institutions. Therefore, the sample may suffer from bias, namely, a higher socioeconomic status with greater health status. This is noted by the sample's relatively lower BMI than national average [36,37]. Therefore, future studies examining the HFS survey should draw samples from more diverse subpopulations and possibly employ random sampling techniques. Two, the size of the sample in this pilot study was relatively small and did not allow for smaller correlation coefficients to become significant. Specifically, the correlations between the spirituality scales and happiness may still be meaningful in the psychosocial literature due to their "small" effects, albeit, not statistically significant [38]. Therefore, future studies evaluating the HFS survey should consider statistical power when designing the methodology. Third, and lastly, since this study analyzed only participant data that were complete (i.e., complete case analysis), some bias may have been introduced if data are not missing completely at random (MCAR). Future studies evaluating the HFS survey should consider various imputation methods for missing data and/or consider different scoring methods for scale scores with missing data [39].

CONCLUSIONS

Initial pilot study results examining a brief health, fitness, and spirituality (HFS) survey indicates that it functions well in measuring its intended constructs as administered in electronic form. Additionally, reliability and validity evidence supports the use of a brief multi-item happiness scale useful for health-related research. Finally, findings indicate that a single item of self-assessed fitness is appropriately associated with health variables and therefore has vast potential for epidemiological research.

CONFLICTS OF INTERESTS

No financial assistance was used to assist with this project.

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