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Abridging the Human Activity Profile (HAP): Item Reduction for Ambulatory Outpatient Populations

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ABSTRACT

Introduction: The purpose of this study was to develop an abridged Human Activity Profile (HAP-A) for ambulatory patients.

Methods: Classical test theory item reduction model and exploratory factor analysis (EFA) were used, including maximum likelihood factor extraction with Kaiser varimax rotation, eigenvalues >1 retained, and item loading cutoff of 0.4, followed by confirmatory factor analysis (CFA) and internal consistency reliability analyses. Data were originally collected from an outpatient ambulatory tertiary care clinic and research site of a large nonprofit health system hospital medical campus located in a metropolitan area of the northeastern United States. Four hundred and fifty-five de-identified healthy controls and people with chronic liver diseases or autoimmune or metabolic conditions with basic demographic information and completed HAP were collected across one retrospective and four prospective studies with institutional review board approval over 15 years (2006–2021). Main analyses included maximum and adjusted activity scores (MAS and AAS), EFA and CFA, internal consistency reliability (Cronbach's α, McDonald's ω), and convergent validity.

Results: HAP and HAP-A MAS and AAS measures were statistically indistinguishable ($P = 1.00$, paired t-tests). HAP-A Cronbach's α was 0.892, and McDonald's ω was 0.902. CFA revealed three factors (domains) in 29 questions: factor 1, high activity/sport (5.7–10.3 metabolic equivalents (METs)); factor 2, light mobility/leisure (0.9–7.1 METs); and factor 3, chores/activities of daily living (<0.9–6.6 METs). Using CFA, 28 of 29 items loaded as expected; Tucker–Lewis Index, comparative fit index, and root mean square error of approximation were modest (0.716, 0.738, and 0.110, respectively), likely due to cohort composition shifts. Controlling for age, sex, body mass index, hypertension, hyperlipidemia, and diabetes, HAP-A's AAS score retained its significant correlation with the Fatigue Severity Scale (FSS) (analysis of covariance sum of squares, 6.097; 1 degree of freedom; mean square, 6.097; $P = 0.03$).

Conclusions: HAP and HAP-A scores were statistically indistinguishable and preserved a significant correlative relationship with a validated fatigue measure (FSS). HAP-A is a reasonable HAP alternative in ambulatory patients.

Keywords: activity, factor analysis, fatigue, psychometrics

INTRODUCTION

The Human Activity Profile (HAP)—with or without the optional eight-question dyspnea (shortness of breath) scale form—is an established measure of activity with decades of use across a variety of populations of patients with chronic conditions (1–32). HAP is very useful because it is highly sensitive to small changes in activity level over time, anchored in metabolic equivalents (METs), and provides daily/adjusted activity scores (AAS) and maximum activity scores (MAS) (1–6). HAP also offers impairment and disability thresholds via percentiles by age (accounting for changes in lung capacity with age) and is strongly correlated with functional and performance measures, such as cardiopulmonary exercise testing, the 6-min walk time test, and grip strength (1–9). HAP is free to use, and HAP forms may be requested from its authors (3).

Beyond HAP's strong psychometric properties, HAP also has several design features that make it easy to administer (1–3). Items are presented in shaded grid form for easy checkbox completion (1–3). Instructions for HAP allow for the subject's perception of whether they *could* engage in an activity, not just whether they currently engage in it (1–3). HAP's questions cover activities with a wide range of metabolic demands, from sitting up in bed to running 3 miles in 30 min, as well as both upper and lower extremity activities and multiple activity options for each gradation of MET (1–6). Further, HAP MAS and AAS subscale scoring is fairly robust to missed item completion. A self-report instrument, HAP has been shown to provide a valid measure of peak oxygen consumption and is an accepted measure of exercise capacity (4,33). The literature supports its use in a variety of patient populations, including hospitalized patients and those with arthritis, cardiac

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disease, pulmonary disease, and stroke (4,7,33). In fact, HAP is recommended when people are unable to perform standard cardiorespiratory testing (4,7).

Given its ability to detect small changes in activity (5), HAP is a useful tool for exercise research, informing exercise intervention providers of a participant's starting point and suitability for participation prior to engaging in an established exercise program, as well as helping to inform the design and implementation of individualized exercise programs. The ability to obtain a rapid understanding of current activity level and MET expenditure is especially important to assess and provide support to a general US population in which only 46.9% of adults met aerobic guidelines and only 24.2% of adults met both aerobic and strength training guidelines in 2020 per the Centers for Disease Control and Prevention, meaning a large portion of the US population might need additional support for activity- and exercise-related health behavior change (34,35).

A shorter HAP, maintaining its original utility and properties, may provide a quick snapshot of starting activity and exercise engagement with more granularity in terms of METs and types of activities engaged in than can be derived from either exercise or physical activity vital sign (EVS or PAVS) clinical assessment questions of frequency, intensity, and duration to inform exercise prescription (36). Although EVS and PAVS are brief and provide screening guidance for identifying referrals for additional activity and exercise guidance, both are insufficient to inform individualized guidance on increasing physical activity and exercise. EVS has moderate sensitivity and specificity for identifying those not meeting physical activity recommendations (36), and PAVS has only a modest correlation with accelerometry data (37). Use of EVS and PAVS also assumes that follow-up exercise and physical activity consultation by a tertiary referral source is feasible for a given patient, which for logistical, geographic, or socioeconomic reasons may not be the case (38,39). This shorter HAP could provide a new tool to assist in rapid assessment of activity level as a first step toward intervention in those with, or at risk of, poor outcomes due to a sedentary lifestyle.

Despite an impressive range of strengths, HAP does have some drawbacks that are notable with regular use. The official estimated time for administration is 5–10 min; at 94 questions, HAP is long and can take a significant amount of allotted clinic or study visit time for subjects to complete (4,5). Use of HAP in our own nonprofit, investigator-driven studies over the past two decades have led to the observation that many lower MET level questions lacked variance in response when administered in a nonpulmonary, ambulatory, outpatient population.

Item reduction or otherwise editing a questionnaire can be a fraught process (40). The measure may lose reliability, validity, sensitivity, specificity, or current correlates with other measures, even with the best approach (35,41). However, the item reduction process in an established measure has a few serious advantages over *de novo* test construction, including that wording and item options have already been validated in the original measure, which removes the necessity for very time-intensive and costly patient and specialist focus group segments of the test construction process (40,41).

This psychometric project was conducted with the objective of shortening the HAP for wider application and ease of use within ambulatory outpatient, hospital, and other clinical research settings with the benefit of its already wide use and validation of select items, as well as the confidence that comes from an assessment anchored in a physical biological measure such as metabolic equivalents. Practitioners seek strong measures with ease of administration in a variety of settings to provide information about changes in activity level, function, and performance, as well as to satisfy newly implemented reimbursement requirements (35). An abridged HAP (HAP-A) would be ideally suited to meet this need. Professional societies and national and international health organizations have championed the provision of prescriptive exercise information, counseling, and progress tracking for patients (42–50). A shorter HAP that maintains its structural soundness as a cohesive questionnaire would successfully incorporate activity levels in a clinically meaningful way. Like the original HAP, this adaptation is meant to be free for use in research. HAP-A in no way substitutes for providing a formal request for HAP forms to the HAP creators.

METHODS

Location, Patient Selection, and Data Collection

Data were collected from research undertaken in outpatient tertiary care and inpatient care facilities of a large nonprofit health system hospital medical campus located in a metropolitan area of the northeastern United States and were analyzed under Western Institutional Review Board (IRB)–approved specimen collection and associated data analysis protocol (WIRB #20203699). A heterogeneous de-identified convenience dataset was available for use in exploratory and confirmatory factor analyses (EFA and CFA). The dataset comprised 562 outpatient subjects with preexisting, complete HAP measures collected across one retrospective and four prospective IRB-approved studies in an ambulatory outpatient setting over 15 years (2006–2021), spanning primary concerns (chronic liver disease, metabolic and autoimmune conditions), as well as controls without any major chronic conditions.

Inclusion/Exclusion Criteria

No subject exclusions were made in this pragmatic approach to create a validated, abridged measure widely applicable across diverse populations with chronic conditions. All subjects were adults aged 18 yr or older, not pregnant at the time of measure administration, and either healthy controls or conclusively diagnosed with a chronic condition of interest in the original studies. All subjects were capable of completing the original HAP and providing informed consent without aid of a legally authorized representative or guardian. For a full list of all study-specific inclusion and exclusion criteria, please see Supplemental Content 1 (table, http://links.lww.com/EM9/A29).

Human Subjects Research Approval

All data were originally collected under hospital IRB-approved protocols in accordance with the policy statements of the American College of Sports Medicine, with written informed consent, which included use of research data for further research. Demographic variables also included indicators of condition severity and other patient-reported outcomes measures, which could be used to drill down on any interesting findings, trends, or outliers discovered during the analysis and validation processes.

Statistical Methodology

Continuous variables were summarized by mean and standard deviation (SD). All analyses were performed using jamovi 1.6.23 (51).

Exploratory Factor Analysis

A case count of 50 is an absolute minimum for EFA (52,53). EFA data had over four times the threshold with 217 cases (cohort

demographics are presented in Table 1; also see Supplemental Content 1, table, http://links.lww.com/EM9/A29). The EFA process used in this analysis followed the classical test design process rather than focus group consensus (55). Varimax rotation (also called Kaiser varimax rotation) maximizes the sum of the variance of the squared loadings (i.e., correlations between variables and factors). In simple terms, the result is a small number of highlighted important variables, which makes it easier to interpret results. Varimax was compared to and selected over quartimax, promax, oblimin, and simplimax rotation options due to the suitability of application to this dataset. In statistics, a varimax rotation is used to simplify the expression of a particular subspace in terms of just a few major items and the actual coordinate system remains unchanged; the orthogonal basis is rotated to align with those coordinates.

A maximum-likelihood extraction and varimax rotation were used with the number of factors based on eigenvalues, a well-established combination recommended specifically for test design/item reduction with decades of use. The maximum-likelihood method is a factor-extraction method that produces parameter estimates that are most likely to have produced the observed correlation matrix if the sample is from a multivariate normal distribution; it was weighed against and selected over alternate extraction methods, such as minimal residuals and principal axis. An eigenvalue is a measure of how much of the variance of the observed variables a factor explains. Any factor with an eigenvalue ≥1 explains more variance than a single observed variable. The number of factors based on eigenvalues >1 was compared to and chosen over the alternate options of using parallel analyses or a fixed number of factors.

Items were further reduced based on the strength of their factor loadings and unique contributions of variance.

Construct Validity

An all-item factor analysis was conducted looking at both diagnostic cohorts and all comers. Items lacking variance across our hundreds of exploratory factor analysis participants were eliminated immediately. Item clusters and numbers of natural domains and their likely descriptions were recorded, and items weakly correlated with the rest of the group were iteratively removed during item reduction. Minimum loadings were required for all items. HAP MAS and AAS distributions were compared to their distributions on HAP-A.

Confirmatory Factor Analysis

Data for the CFA included 238 cases (see cohort demographics in Table 1), which approximate the EFA (217 cases) and are again several times above the minimum required for this analysis (52,53). The three main model-fit indices used in the CFA were model chi-square statistic obtained from the maximum-likelihood statistic (similar to the EFA), confirmatory factor index (CFI) with values between 0 and 1 (values greater than 0.90, conservatively 0.95 indicates good fit), and root mean square error of approximation (RMSEA; values of 0.01, 0.05, and 0.08 indicate excellent, good, and modest fit, respectively; some go up to 0.10 for mediocre). A P value of close fit was obtained with RMSEA <0.05. The Tucker–Lewis Index (TLI), ranging from 0 to 1, with values greater than 0.90 indicating good fit, was also run.

Convergent Validity and Interpatient Reported Outcome Comparison/Triangulation

To explore whether the HAP-A AAS retains the correlation with fatigue (as measured by the Fatigue Severity Scale (FSS)) seen with the full HAP, paired t-tests, Pearson correlations, and analysis of covariance (ANCOVA) were run on a subset of subjects with all measures. Item-reduced HAP-A AAS and MAS were compared in a subset analysis. Correlations to other variables of interest with established correlations to the original HAP (e.g., fatigue) were run to determine if relationships still held, weakened, or improved. The fatigue subset analysis maximized the number of subjects for its discrete cohort analysis correlations.

Table 1

Demographics by Cohort and Analysis Grouping.

	Cohort 1	Cohort 2	Cohort 4	Cohort 5	Cohort 6	EFA	CFA
n	217	82	36	33	87	217	238
Age, yr (mean ± SD)	52.0 ± 10.9	47.0 ± 12.8	49.1 ± 10.8	54.5 ± 19.1	51.1 ± 13.6	52.0 ± 10.9	49.8 ± 14.0
% Female	56.2%	36.6%	75.0%	75.8%	47.1%	56.2%	56.3%
% White	66.8%	67.1%	72.2%	57.6%	64.4%	66.8%	65.5%
% Black	7.4%	8.5%	16.7%	21.2%	8.0%	7.4%	11.8%
% Hispanic[a]	2.8%	3.7%	5.6%	12.1%	6.9%	2.8%	6.3%
% Asian or Pacific Islander	14.3%	18.3%	0.0%	9.1%	17.2%	14.3%	13.9%
% Other	8.2%	1.2%	2.7%	0.0%	3.1%	8.2%	1.7%
% Native American or Alaskan Native	0.5%	1.2%	2.8%	0.0%	0.0%	0.5%	0.8%
BMI, $kg \cdot m^{-2}$ (mean ± SD)	29.3 ± 7.2	30.6 ± 5.9	42.7 ± 8.4	27.9 ± 6.7	30.4 ± 6.4	29.3 ± 7.2	31.7 ± 8.1
Diagnostic categories pertinent to original inclusion/exclusion criteria							
Metabolically associated fatty liver disease, *n*	58	17	36	0	65	58	118
Rheumatological diagnosis, *n*	0	0	0	33	0	0	33
Chronic viral infection, *n*	85	0	0	0	0	0	0
Other chronic condition, *n*	58	0	0	0	0	58	0
Hepatitis C-SVR, *n*	0	44	0	0	0	0	44
Control group in study, *n*	16	21	0	0	19	16	40

The study cohort recruitment was representative of the general community population per Table 2.5 in ref. (54), which reports the following racial and ethnic distributions: 49.5% White, 20.5% Asian or Pacific Islander, 17.3% Hispanic, 9.6% Black, 0.6% American Indian or Alaskan Native, 19.8% other.

[a] Hispanic persons may be of any race.

BMI, body mass index; CFA, confirmatory factor analysis; EFA, exploratory factor analysis; SD, standard deviation; SVR, sustained virologic response (undetectable posttreatment 12 wk or more).

RESULTS

Exploratory Factor Analysis

For EFA, a minimum loading cutoff of 0.4 was implemented (see Supplemental Content 2, http://links.lww.com/EM9/A30). Three factors, or domains, emerged during the item reduction process (Fig. 1). Multidimensionality was observed, with a total of 29 retained questions between factor 1 (9 questions), factor 2 (8 questions), and factor 3 (12 questions) with a minimum factor loading of 0.362 and a minimum uniqueness of 0.331. The factors are as follows:

- Factor 1, high activity/sport (5.7–10.3 METs): Running or jogging 3 miles, basketball, running or jogging a quarter mile, running 110 yards, bicycling 2 miles (nonstop), bicycling 1 mile, walking 3 miles (non-stop), shoveling/digging/spading
- Factor 2, light mobility/leisure (0.9–7.1 METs): Walking 30 yards/27 meters nonstop, walking half a block uphill, dining at a restaurant, walking half a block on level ground, walking two blocks on level ground (nonstop), walking six blocks on level ground, walking 1 mile
- Factor 3, chores/activities of daily living (ADLs) (<0.9–6.6 METs): Making a bed (changing sheets), scrubbing (floors, walls, car), dusting/polishing furniture or polishing a car, cleaning windows, washing clothes (by yourself), sweeping, carrying a light load of groceries, cooking your own meals, kneeling/squatting to do light work, using public transportation, or driving a car (100 miles or more)

Construct Validity

HAP MAS and AAS ranges and distributions were compared to their ranges on HAP-A, and the equivalent distribution was confirmed (see Table 2 and Figs. 2, 3).

Reliability Analysis

In the internal consistency reliability analysis, a Cronbach's alpha of 0.892 (McDonald's ω of 0.902) was achieved.

Confirmatory Factor Analyses and Model Fit

The first and third factors are flipped in order of representation between the EFA and CFA cohorts, likely due to the healthier CFA cohort and addition of controls in the combined dataset with less restriction of activity present (see Supplemental Content 2, http://links.lww.com/EM9/A30). EFA and CFA cohorts were then combined, and factor loadings compared to EFA (see Supplemental Content 2, http://links.lww.com/EM9/A30). Combined cohort primary factor loadings of items still held, though lower loading on a secondary factor was seen for some items. Confirmation in our second dataset was modest (exact test for goodness of fit (chi square, 1448; degrees of freedom (*df*), 374; $P < 0.001$); CFI, 0.738; TLI, 0.716; standardized root mean squared residual (SRMR), 0.108; RMSEA, 0.110, and RMSEA confidence interval, 0.104–0.116; Akaike information criterion, 5970; Bayesian information criterion, 6282); however, our second dataset did not have the same range of chronic liver disease severity (though chronic liver disease was included in both EFA and CFA cohorts) and includes healthy controls.

Convergent Validity

A dataset containing 88 cases of complete data (age, 51.2 ± 13.5 yr; body mass index (BMI), 30.4 ± 6.3 $kg \cdot m^{-2}$; 52.3% male; 47.7% BMI >30; 36.4% diabetes; 46.6% hypertension; 50.0% hyperlipidemia; 38.6% metabolic syndrome) demonstrated that HAP-A retains its significant association with fatigue as measured by FSS. HAP and HAP-A MAS and AAS measures remain highly correlated and appear to be statistically indistinguishable ($P = 1.00$ on paired *t*-tests). Controlling for age, sex, BMI, hypertension, hyperlipidemia, and diabetes, HAP-A AAS remains significantly correlated

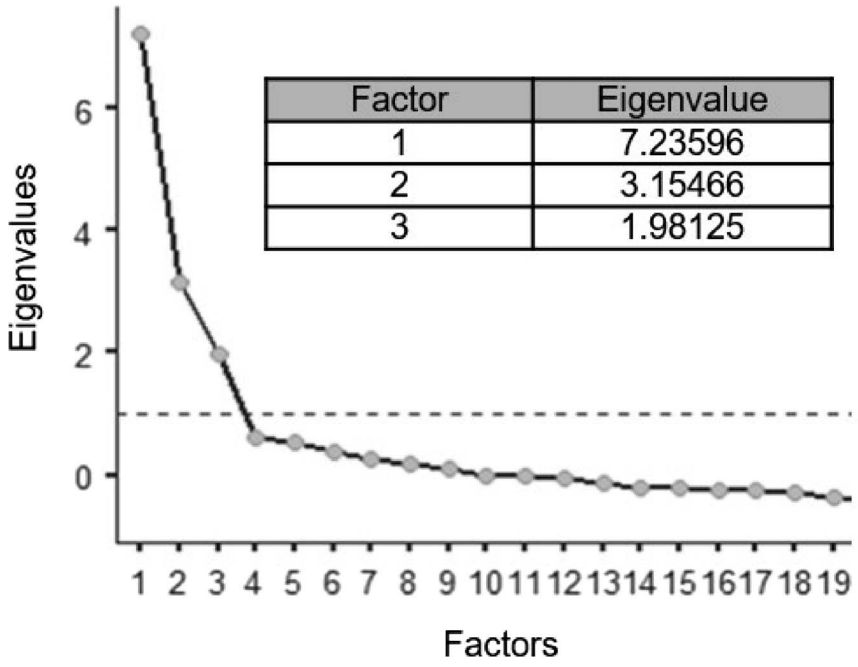

Figure 1. Scree plot of eigenvalues for exploratory factor analysis. Note how the eigenvalues of the scree plot dip below 1 after 3 values; this dictates the number of factors to retain as domains or subscales in the finalized 29-item Human Activity Profile-Abridged (HAP-A) measure.

Table 2

Maximum Activity Scores (MAS) and Adjusted Activity Scores (AAS) for the Human Activity Profile (HAP) and Human Activity Profile-Abridged (HAP-A).

	HAP MAS	HAP-A MAS	HAP AAS	HAP-A AAS
n	217	217	256	248
Mean	78.4	23.4	70.8	21.1
SE of mean	0.794	0.263	1.320	0.397
Median	78.0	23.0	75.5	22.0
Mode	82.0	24.0	94.0	22.0
Sum	17,004	5067	18,129	5242
SD	11.70	3.88	21.10	6.25
Variance	137.0	15.0	24.0	6.0
Skewness	–0.751	–0.907	–1.380	–1.360
SE of kurtosis	0.329	0.329	0.303	0.308
25th percentile	73.0	20.0	63.0	19.0
50th percentile	78.0	23.0	75.5	22.0
75th percentile	88.0	26.0	87.0	25.0

SD, standard deviation; SE, standard error.

with fatigue (FSS) (ANCOVA sum of squares (SS), 6.097; *df* 1; mean square, 6.097; $P = 0.03$), with a stronger correlation than the full HAP AAS (ANCOVA SS, 4.491; *df* 1; mean square 4.491; $P = 0.07$) in this cohort. The three new qualitative activity factors in the HAP-A show low but significant correlations with FSS using Pearson correlation (high activity/sports: $r = 0.262$, $P = 0.007$; light activity/leisure: $r = 0.216$, $P = 0.01$; ADLs/chores: $r = 0.230$, $P = 0.003$), and all significance disappears when age and components of metabolic syndrome are controlled in ANCOVA, implying that age and metabolic comorbidities strongly influence the relationship between fatigue and activity level.

DISCUSSION

Although decisions about who can safely exercise are often made based on cardiorespiratory data, including screening questionnaires such as the Physical Activity Readiness Questionnaire and Physical Activity Readiness Medical Evaluation (56), and rapid screening of physical activity and exercise guideline adherence can be achieved with EVS or PAVS (35–37), adding some measure of functional level provides an important dimension of assessment, which HAP and now HAP-A offer. HAP-A provides additional granularity for quickly informing individualized activity and exercise prescriptions, which is especially useful to healthcare providers when successful referral to additional exercise evaluation and consultation may not be feasible for logistic, geographic, or socioeconomic reasons. HAP-A provides reliable/valid information about preexisting MET levels of activity and exercise

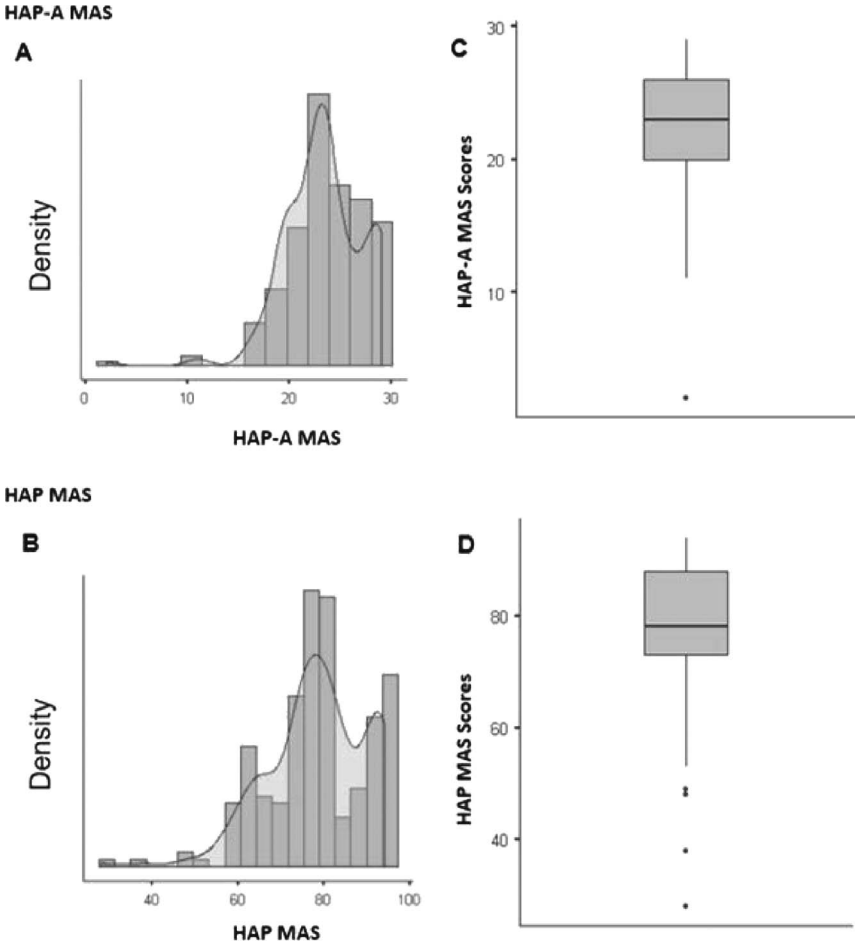

Figure 2. Maximum activity score (MAS) comparison of the full Human Activity Profile (HAP) to the Human Activity Profile-Abridged (HAP-A). MAS is determined by the highest metabolic equivalent level activity the participant reports being capable of doing. The MAS distributions for HAP and HAP-A were statistically indistinguishable. (A) HAP-A MAS distribution graph. (B) HAP MAS distribution graph. (C) HAP-A MAS distribution box plot. (D) HAP MAS distribution box plot.

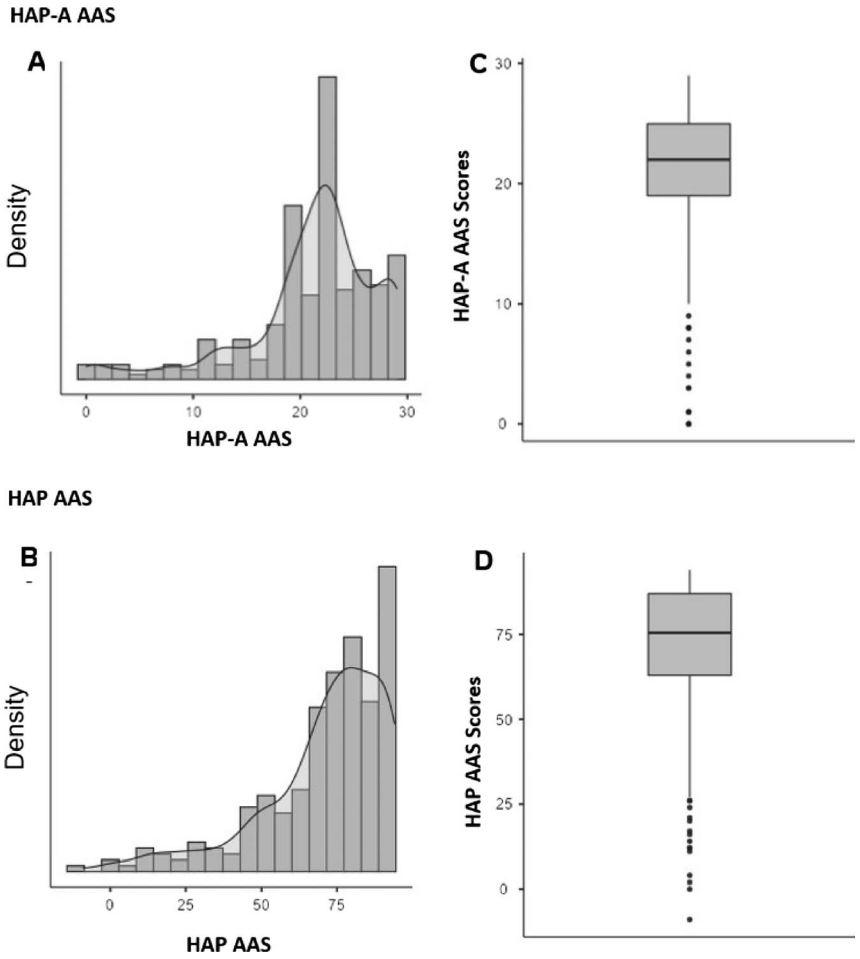

Figure 3. Adjusted activity score (AAS) comparison of the full Human Activity Profile (HAP) to the Human Activity Profile-Abridged (HAP-A). AAS is an estimate of daily activity metabolic equivalent level, calculated as the maximum activity score minus the questions prior to it marked as "no longer doing" by the participant. The score distributions of HAP and HAP-A were statistically indistinguishable. (A) HAP-A AAS distribution graph. (B) HAP AAS distribution graph. (C) HAP-A AAS distribution box plot. (D) HAP AAS distribution box plot.

engagement and can help to provide insights into activities and exercises that are likely to be tolerated. Quickly obtaining a better understanding of exercise tolerance and daily activity level anchored in METs assists healthcare providers in recommending activity and exercise prescriptions that may be accepted by patients and fit more easily into their daily routines. HAP-A may assist in the selection of a level of exercise that is likely to be both safe and adopted.

As the risks of a sedentary lifestyle and reduced activity level become more apparent, the need for a reliable, sensitive, and widely applicable metric for quickly identifying activity level has become more important than ever (57). Obtaining a baseline snapshot of current activity level and METs engagement will assist clinicians in appropriately matching the METs demands of exercise recommendations to individuals in a way that can help foster early success experiences with new exercise prescriptions and aid habit formation. The cohorts included in this study are representative of a growing percentage of the population with chronic conditions. Patients with overweight or obesity, metabolic dysfunction associated steatotic liver disease, autoimmune disorders, and hepatitis benefit from exercise and sport participation (58).

This attempt to abridge HAP for wider utility appears largely successful, per the statistical analysis of a moderately large and pragmatic ambulatory outpatient sample spanning a range of chronic conditions (e.g., hepatic, metabolic, cardiovascular, rheumatologic, autoimmune) and controls lacking major chronic condition diagnoses. HAP and HAP-A MAS and AAS were statistically indistinguishable. The significant association of HAP AAS and fatigue as seen in previous analyses and measured by FSS is slightly stronger in the abridged version of HAP (HAP-A).

Emergent Domains

The emergence of domains during item reduction was unexpected, as was the overlapping metabolic range between the emergent domains. However, each domain can be clearly defined as a type of activity, and collectively, the retained items both had the most variance and contributed unique information in the ambulatory outpatient population data utilized. The emergent domains will provide additional information for clinicians on the types of activities already engaged in and to what degree, which may inform individualized interventions for improved activity level.

Study Limitations

Confirmation in our second dataset was modest per confirmation indices. Further examination determined that the CFA dataset did not have the same range of illness severity in its chronic liver disease cases. The CFA cohort also included healthier controls. Dividing EFA and CFA cases by studies versus splitting study cases between EFA and CFA cohorts may have biased the analysis toward worse model-fit scores. Despite this limitation, overall factors and loadings held between comparisons (see Supplemental Content 2, http://links.lww.com/EM9/A30), with seven of the eight high activity loadings intact, all 12 ADLs/chores, and eight of nine light/leisure factor loadings remaining unchanged. More granularity by populations, diagnoses, and demographics can be explored in the future. The pragmatic inclusion of HAP scores in the analysis supports its generalizability to the wider patient population. These analysis results—as well as the statistical indistinguishability between the full and abridged HAP domains well above estimated sample size requirements to lessen the risk of type II errors—suggest that HAP-A may be as widely applicable as its parent measure. This analysis does not include children (participants under the age of 18 yr) or pregnant women, nor does it include many older adults.

Future Directions

The item reduction of HAP makes HAP-A a more feasible option for use in a variety of clinical settings outside of research protocols. This specific effort has not been prospectively tested in either the 94-item HAP or HAP-A. As patient-reported outcome measures are increasingly administered electronically and/or remotely, a standardized update to HAP and HAP-A completion instructions will need to be tested. Hopefully, the contribution of the shorter HAP-A will make data for its electronic administration validation more easily and quickly obtained.

Additional analyses to further bolster the argument for the reliability and validity of the new HAP-A format are planned, including longitudinal analyses to check test–retest validity and reliability with our repeated-measures cohorts. Future planned analyses will also address the performance correlates of HAP items with subset analyses containing grip strength, walk time tests, and cardiopulmonary exercise test data. Examination of a slightly less utilized feature of the original HAP, the identification of functional impairment threshold via poor/moderately impaired score thresholds, also needs to be identified in the new measure. One approach is to examine whether cases previously identified as having functional impairment using the full HAP are also identifiable by score with HAP-A.

Conclusions

HAP-A can be useful in assessing activity in ambulatory outpatients with chronic medical conditions. HAP and HAP-A MAS and AAS were statistically indistinguishable. The new HAP-A retains HAP's significant association with fatigue as measured by FSS. HAP-A has three emergent domains of activity that may provide additional insight into activity level and choice of activities. HAP-A provides substantial (69.1%) item reduction, which reduced the measure length from four printed pages of items to a single page of items with a 2-point increase in font size for ease of reading. The time-to-completion estimate also decreased from 5 to 10 min (per the manual (3)) for the full HAP to between 1 and 3 min for HAP-A. HAP-A is an internally consistent alternative to the full HAP in assessing physical activity in ambulatory patients with chronic conditions (2).

CONFLICTS OF INTEREST AND SOURCE OF FUNDING

The authors are unaware of professional relationships with companies or manufacturers who would benefit from the results of the present study. This study was internally funded without grant or other external support.

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The results of the current study do not constitute endorsement by the American College of Sports Medicine. The results of the study are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation.

DATA AVAILABILITY

The datasets generated and/or analyzed during the current study are not publicly available due to institutional data use and sharing policy requirements but are available from the corresponding author on reasonable request via email, and subsequent request review and approval by the institutional research program director.

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