

VALIDATION OF THE HUMAN ACTIVITY PROFILE QUESTIONNAIRE BY TELEPHONE CALL IN CARDIOVASCULAR DISEASE PATIENTS

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Abstract

Background: To validate the application of the Human Activity Profile (HAP) questionnaire via telephone call in patients with cardiovascular disease (CVD).

Objective: Objective of this study is to investigate the validity of applying the HAP questionnaire via telephone call to patients with cardiovascular disease participating in a cardiovascular rehabilitation program.

Methods: Two scores were calculated based upon HAP scores: the maximum activity score (MAS), the number of the most difficult task the respondent is “still doing”; and the adjusted activity score (AAS), the number of items that the individual “stopped doing”, prior to the last one that he “still does”. Patients with CVD answered the HAP questionnaire on 2 random occasions, face-to-face and by telephone call.

Results: Fifty-six patients with CVD (64.30% men) with a mean age of 75.14±10.28 years participated in this study. The MAS was similar in both applied modes (Face-to-face: 79.11±11.48; Telephone call: 82.71±7.48; p=0.101). Similarly, The AAS did not differ in both applied modes (Face-to-face: 69.11±14.18; Phone call: 71.21±13.43; p=0.052). There was high agreement between the two modes of administration (ICC - 0.999; 95%CI, 0.879-0.948; p<0.05). The mean bias and 95% limits of agreement evaluated by Bland-Altman plot for average applied face-to-face and the telephone call versus the mean difference in the MAS and AAS applied face-to-face and the telephone call were, respectively, -4.0 (95%CI 12.1 to -19.3) and -2.1 (95%CI 13.4 to -17.6).

Conclusions: The MAS and AAS from HAP can be applied over the telephone call in patients with CVD. Clinical Trial: CAAE 58283422.0.0000.5134 (number: 5.646.387)

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Original Manuscript

VALIDATION OF THE HUMAN ACTIVITY PROFILE QUESTIONNAIRE BY TELEPHONE CALL IN CARDIOVASCULAR DISEASE PATIENTS

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ABSTRACT

Background: To validate the application of the Human Activity Profile (HAP) questionnaire via telephone call in patients with cardiovascular disease (CVD).

Methods: Two scores were calculated based upon HAP scores: the maximum activity score (MAS), the number of the most difficult task the respondent is “still doing”; and the adjusted activity score (AAS), the number of items that the individual “stopped doing”, prior to the last one that he “still does”. Patients with CVD answered the HAP questionnaire on 2 random occasions, face-to-face and by telephone call.

Results: Fifty-six patients with CVD (64.30% men) with a mean age of 75.14 ± 10.28 years participated in this study. The MAS was similar in both applied modes (Face-to-face: 79.11 ± 11.48 ; Telephone call: 82.71 ± 7.48 ; $p=0.101$). Similarly, The AAS did not differ in both applied modes (Face-to-face: 69.11 ± 14.18 ; Phone call: 71.21 ± 13.43 ; $p=0.052$). There was high agreement between the two modes of administration (ICC - 0.999; 95%CI, 0.879-0.948; $p<0.05$). The mean bias and 95% limits of agreement evaluated by Bland-Altman plot for average applied face-to-face and the telephone call versus the mean difference in the MAS and AAS applied face-to-face and the telephone call were, respectively, -4.0 (95%CI 12.1 to -19.3) and -2.1 (95%CI 13.4 to -17.6).

Conclusion: The MAS and AAS from HAP can be applied over the telephone call in patients with CVD.

Keywords: Physical Functional Performance; Cardiovascular Rehabilitation; Surveys and Questionnaires; Telephone call; Interview

List of abbreviations:**HAP** Human Activity Profile**MAS** Maximum Activity Score**AAS** Adjusted Activity Score**CVD** Cardiovascular Disease**Contribution of the Article**

- This study validates the application of the Human Activity Profile (HAP) questionnaire via telephone call in patients with cardiovascular disease, demonstrating its reliability compared to the face-to-face method.
- Provides a practical and feasible solution for remote functional assessment, particularly in contexts where in-person access is limited, such as during the COVID-19 pandemic.
- Adds evidence to the literature on the use of alternative methods and technologies in cardiovascular rehabilitation, expanding possibilities for remote monitoring in healthcare.

Introduction:

Despite a sustained decline in cardiovascular disease (CVD) morbidity and mortality over the past four decades, CVD remains a leading cause of disease burden worldwide [1,2,3]. Nearly 80% of CVDs occur in low- and middle-income countries, where aging and urbanization trends have accelerated the increase in the burden of CVD [4].

Functional capacity assessment is an important part of clinical evaluation, especially in patients with chronic conditions such as heart failure, lung disease, neuromuscular disease, and other conditions that may affect functionality [3,5,6,7,8]. Maximal exercise tests are widely used in functional capacity assessment, but the high cost may limit their use. Thus, a possible alternative is the application of scales and questionnaires that constitute relatively simple and economical tools, do not require sophisticated equipment and specialized environments to be administered, making them more accessible to a greater number of patients [8]. The Human Activity Profile (HAP) is a simple questionnaire designed to assess the functional capacity of individuals in relation to their daily activities and physical fitness, and can offer a more accessible, convenient and cost-effective approach to assessment [9]. The HAP allows functional capacity to be quantified on an individual basis, providing important information about the health and physical well-being of patients, helping to develop strategies to promote a more active and healthy lifestyle and monitoring disease progression [10,11].

The HAP is a relevant tool for assessing the functional capacity of patients with cardiovascular diseases [11,12]. Studies have shown that in cases of heart failure, the HAP combined with the 6-Minute Walk Test demonstrates a positive correlation with functional capacity, although it does not replace the gold standard cardiopulmonary exercise test [10]. Among patients with Chagas cardiomyopathy, the HAP has been associated with functional

capacity, functional class, and systolic function, highlighting its utility in characterizing functional limitations related to cardiovascular disease [12].

With the onset of the COVID-19 pandemic, healthcare professionals had to adapt to social distancing and saw the need to assess patients with validated telephone instruments. In this perspective, applying questionnaires via telephone can be a relevant and advantageous strategy in certain situations, offering benefits to both patients and healthcare professionals. Therefore, the objective of this study is to investigate the validity of applying the HAP questionnaire via telephone call to patients with cardiovascular disease participating in a cardiovascular rehabilitation program.

Methods

This is a methodological study carried out in accordance with the Consensus criteria - Based Standards for the Selection of Health Measurement Instruments (COSMIN) [13]. According to this consensus, the minimum number of participants required is 50. The study was approved by the Research Ethics Committee. All participants signed the Free and Informed Consent Form.

Participants

The sample was of convenience, involving patients with cardiovascular diseases participating in a Cardiovascular Rehabilitation Program. Patients of both sexes, aged between 50 and 90 years, were included. Patients with auditory and cognitive deficits, as

well as those who did not respond to the second part of the survey within the established deadline were excluded. (Table 1)

Table 1: Sample characterization

Variables	n	%
Sex		
Male	36	64.30%
Age (years)	75.14 ± 10.28	
Weight (kg)	73.02 ± 13.64	
Height (cm)	165.29 ± 10.11	
BMI (kg/m²)	26.65 ± 3.97	
Medication use		
Antihypertensives	48	85.70%
Statins	44	78.60%
Beta blockers	26	46.50%
Anticoagulants	22	39.30%
Anti-glycemic agents	12	21.50%
Cardiovascular diseases		
Coronary artery disease	31	55.30%
Arrhythmia	15	26.70%
Acute myocardial infarction	7	12.50%
Valvulopathy	3	5.35%
Congestive heart failure	2	3.60%
Comorbidities		
Dyslipidemia	55	98.20%
Systemic arterial hypertension	54	96.40%
Obesity	13	23.20%
Diabetes Mellitus	11	19.60%
Chronic Kidney Disease	2	3.60%
Stroke	1	1.80%
Procedures/surgeries performed		
Stent Placement	15	26.80%
Coronary Artery Bypass Grafting	1	1.80%
Valve replacement surgery	1	1.80%

BMI: Body Mass Index

Human Activity Profile (HAP)

The HAP consists of 94 items that assess the individual's self-care, work, social activities and physical activity level, classified according to the energy expenditure required to perform each task. The items are arranged in increasing order of energy expenditure, that is, higher numbers correspond to greater energy expenditure [9,11].

Patients were asked to indicate whether they were “still doing this activity”, whether they had “stopped doing this activity” or “never done this activity”. The HAP can be applied to individuals with different functional levels, from very low (getting up and down from a chair or bed without assistance) to very high (running 4.8 kilometers), thus providing two scores: Maximum Activity Score (MAS) and Adjusted Activity Score (AAS) [9,11]. MAS is the number of the activity that presents the highest oxygen demand that the participant is still performing. The AAS is calculated from the MAS, that is, subtract from the MAS the number of items that the individual “stopped doing”, prior to the last one that he “still does”. This latter score is considered a more stable estimate of the individual's daily activity compared to the MAS. The AAS can be used to classify an individual's overall level of functional capacity into three categories: inactive (score below 53), moderately active (score between 53 and 74), and active (score above 74) [9,14].

Procedure

The HAP questionnaires were administered at two different times: in person and by telephone call. The interval between applications varied from 3 to 14 ($8 \pm 4,5$ days), in an attempt to avoid memory bias between the administration of questionnaires [15]. The questionnaire was administered by just one trained investigator, who standardized speech during data collection at both moments. The order of application was not random to ensure

participant acceptance and avoid dropouts during data collection.

Statistical analysis

The categorical variables were expressed as absolute frequencies and their corresponding percentages and the continuous variables were expressed as mean and standard deviation. To check for convergent validity, the mean difference (MD) between in-person and telephone call assessments was calculated along with a 95% confidence interval (CI). The Alfa of Cronbach was calculated in order to assess the internal consistency of the instruments. Values above 0.70 indicate good consistency. The coefficient of correlation intra-class (ICC) was used to investigate the temporal stability and reproducibility of the total score obtained on the HAP questionnaire when administered in person and over the telephone call. The magnitude of the ICC was classified as very high ($> 0,90$), high (0,70 to 0,89), moderate (0,50 to 0,69), low (0,26 to 0,49), and very low ($< 0,25$) [15].

The Bland-Altman approach was used to examine the agreement between mean MAS and the AAS in-person and telephone call and mean difference in-person and telephone call. The following equation was used to compute the upper and lower limits of agreement as well as the mean and SD of the differences between the two measurements: a bias of 1.96 SD. All analyses were conducted using the statistical software R, with evaluations taking a 5% level of significance into account.

Results

Patients were recruited during the period from 10/10/2022 to 31/07/2023. In total, 110 participants were eligible for the study, 75 signed the informed consent form (TCLE) and 1 withdrew from participating in the research. Seventy-four participants responded to the first stage of the research and 18 participants did not answer the phone calls or did not respond to the questionnaire in person within the established deadline of a maximum of 14 days (Figure 1). The remaining 56 participants completed the second stage of the survey and were included in the study.

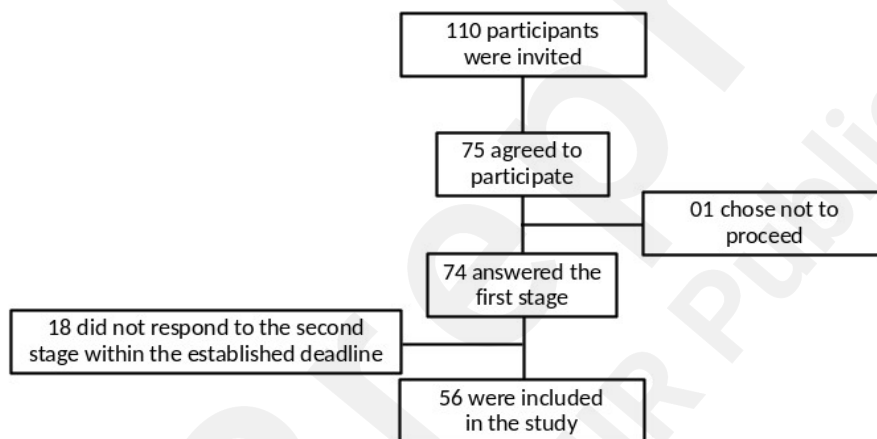


Figure 1: Sample Characterization

The study was performed with a sample considered suitable for instrument validation [13]. Men and women with a mean age of 75.14 ± 10.8 years were included. The predominant risk factors were dyslipidemia (98.20%) and arterial hypertension (96.40%).

The HAP questionnaire showed good internal consistency measured by Cronbach's alpha and good reproducibility/temporal stability measured by ICC (Table 2). The HAP questionnaire scores, carried out in person and by telephone call, did not differ from each other ($p>0,05$) (Table 3). Figures 2 and 3 show the level of concordance between MAS or AAS applied face-to-face and telephone call versus mean difference in the MAS or AAS applied face-to-face and the telephone call. The Bland-Altman plot evaluated the mean bias and 95% limits of agreement between the average MAS scores obtained through face-to-face evaluations and telephone call. The mean difference in MAS scores was found to be -4.0 (CI95% 12.1 to -19.3) and for AAS applied face-to-face and the telephone call, it was -2.1 (CI95% 13.4 to -17.6). Table 4 shows the patients' general level of physical fitness and activity, categorized by the AAS in face-to-face and telephone call modes.

There was no one in the sample with the lowest and highest possible scores for MAS (0 or 94) or AAS (1 or 94). Therefore, no ceiling or floor effect was observed in our sample, thus not limiting the instrument's responsiveness.

Table 2: Internal consistency and temporal stability of the HAP questionnaire

HAP	ICC (Temporal stability)	CI 95% of ICC	Alfa de Cronbach (Internal consistency)	IC 95% of Alfa
MAS	0.794	0.649 – 0.879	0.919	0.879 – 0.948
AAS	0.910	0.847 – 0.947		

ICC: Intraclass correlation coefficient. CI: Confidence interval. MAS: Maximum activity

score. AAS: Adjusted activity score.

Table 3: Internal consistency and temporal stability of the HAP instrument comparing face-to-face and telephone call application.

HAP	Mean	SD	Mean difference	P value
MAS Face-to-face	79.11	11.48	-3.61	0.101
MAS Telephone	82.71	7.48		
AAS Face-to-face	69.11	14.18	-2.11	0.052
AAS Telephone	71.21	13.43		

SD: standard deviation. MAS: Maximum activity score. AAS: Adjusted activity score.

Table 4: Categorization of the general level of physical fitness and activity assessed by the AAS in face-to-face and telephone modes into inactive, moderately active and active.

	Face-to-face N (%)	Mean score EAA	Telephone call N (%)	Mean score EAA
Inactive	7 (12.5)	42.42	4 (7.14)	40.75
Moderately active	24 (42.85)	64.68	24 (42.85)	64.87
Active	25 (44.64)	80.33	28 (50)	81

MAS: Maximum activity score. AAS: Adjusted activity score.

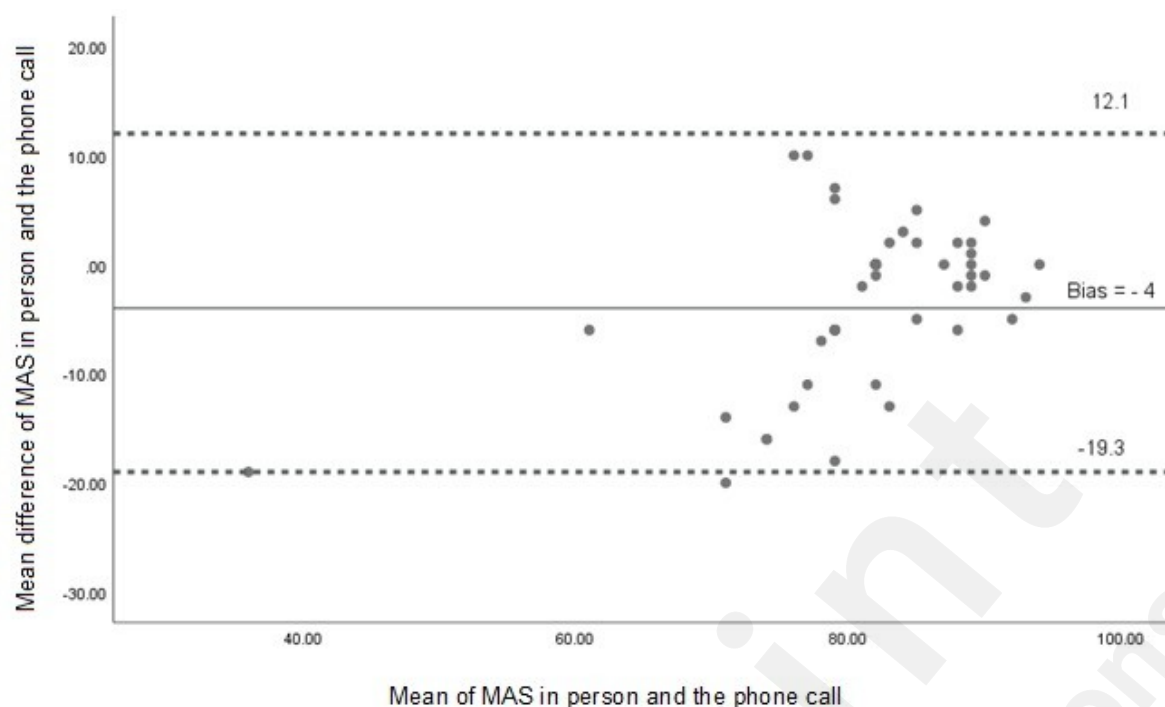


Figure 2: Bland-Altman plots were used to evaluate the agreement between the MAS scores obtained through face-to-face assessments and telephone calls. The mean difference in MAS scores between face-to-face assessments and telephone calls was also represented, along with the limits of agreement (represented by a dotted line) ranging from -1.96s to +1.96s.

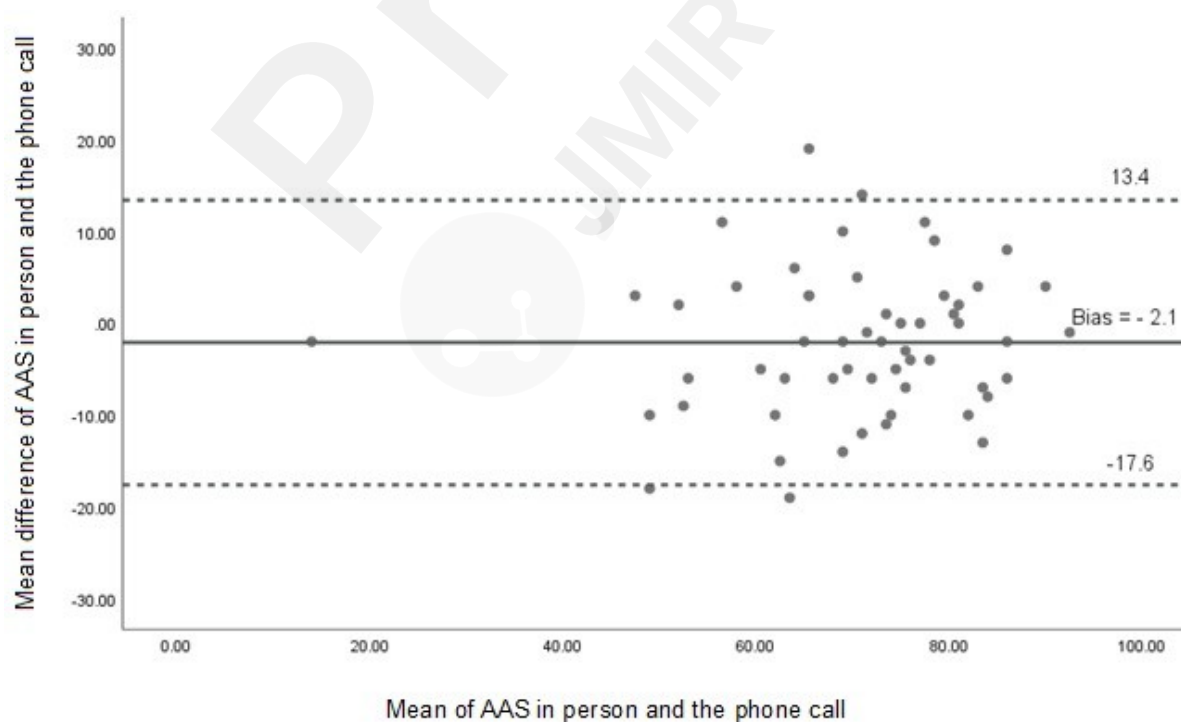


Figure 3: Bland and Altman plots were used to assess the agreement between the AAS scores obtained through face-to-face evaluations and telephone calls. The mean difference in AAS scores between face-to-face evaluations and telephone calls was also represented, along with the limits of agreement (shown by a dotted line) ranging from -1.96s to +1.96s.

Discussion

The present study demonstrated that the MAS and AAS from HAP questionnaire, administered by telephone, is valid for assessing the level of functional capacity patients with cardiovascular disease.

The HAP has been used to measure the general. The questionnaire allows for rapid and meaningful measurement of changes in activity level, comparisons of activity level with populations considered healthy, and activity levels that may be associated with real or incipient medical disorders [11]. HAP was correlated with objective measures of cardiorespiratory fitness [18] and has been validated and determined to be sensitive to changes over time in patients with chronic pain and knee osteoarthritis [17].

The questionnaire presented good internal consistency measured by Cronbach's Alpha (0.919) and good reproducibility/temporal stability measured by the ICC, for MAS (ICC – 0.794) and AAS (ICC – 0.910). The reliability of the HAP was evaluated by test-retest in several studies in different populations [17,18]. In a systematic review, Davidson & Morton (2007) demonstrated a high level of consistency of MAS (0.76 – 0.97) and of AAS (0.79 – 0.97), also showing a high level of consistency in repeated measurements [14]. These same authors analyzed the measurement properties (reliability, validity, responsiveness) of HAP in a variety of clinical populations and healthy individuals.

According to the results of the review, the questionnaire appears to be a useful indicator of physical activity levels in several diseases, including heart disease and healthy elderly people [14].

The Cronbach's Alpha found in the present study was 0.919, considered almost reliable perfect [19]. Similar results were observed by Souza et al (2006) who found a Cronbach's alpha of 0.91 when HAP was applied in the form of an interview to a community-dwelling elderly population [9]. The authors believe that this result indicates stability of the calibration of the questionnaire items. In another study, Souza et al (2017) found Cronbach's alpha of 0.93 when applying HAP to young and elderly adults hospitalized for less than 48 hours for clinical or surgical reasons [20].

The scores for internal consistency and temporal stability of the HAP instrument, comparing in-person and telephone administration, did not differ from each other, suggesting that the HAP remained stable in both modes of administration. Considering face-to-face administration, our values were similar to those observed by Parry et al (2012), where the averages for MAS and AAS were 71.6 and 63.6, respectively, in a population of men and women undergoing coronary artery bypass graft surgery [14]. Similarly, Ribeiro-Samora et al (2016) found MAS of 79.76 and AAS of 65.81 in a population of 62 patients with heart failure [10]. To our knowledge, our study is the first to evaluate the internal consistency and temporal stability of the HAP, comparing in-person and telephone administration.

The Bland-Altman analysis in the present study suggests good agreement between MAS and AAS in face-to-face and by telephone call. The results show that the differences between measurements are within the expected limits of agreement, suggesting that there was no significant bias between the two methods. The upper and lower limits of agreement for MAS were 12.1 and -19.3 and for AAS 13.4 and -17.6, respectively. To our knowledge,

no study has explored agreement between MAS and AAS applied in person and by telephone call.

Previous studies used the application of various instruments over the telephone in patients with cardiovascular diseases [21,22] and after stroke [23]. During the nationwide lockdown imposed by COVID-19 pandemic, Gona et al assessed the clinical pharmacist-initiated telephone-based patient education and self-management support for patients with cardiovascular disease [21]. Blumental et al evaluated the angina prevalence and frequency among stable outpatients with cardiovascular. Recently, Dias et al (2023) applied the Duke Activity Status Index (DASI) questionnaire and concluded that the instrument is valid for assessing functional capacity and can be applied by telephone to chronic stroke survivors. Telephone questionnaires make it possible to collect data quickly and directly, allowing real-time information, in addition to reaching a wide range of participants, including those people who may have difficulty attending in person [23]. To our knowledge, the present study is the first to validate the use of HAP by telephone in patients with CVD.

Strength and limitations of the study

The assessment of physical activity level is an integral part of exercise programs, whether face-to-face or home-based exercise programmers. Assessing functional capacity over the phone can make home-based exercise programs more accessible to a wider audience, including people living in rural or remote areas, people with limited mobility and those who have difficulty attending in-person appointments. It can also be useful for carrying out multicenter research, allowing broad data collection in different geographic locations in an efficient and economical way. Furthermore, it is worth highlighting that

functional tests have a high financial cost or are impractical for certain populations [24,25,26,27].

However, it is worth noting that the application of the HAP has some limitations. Some patients may have difficulty expressing themselves and understanding language or may have hearing deficits. Moreover, the relatively low use of technology among older people, along with socioeconomic and ethnic disparities, could amplify these challenges [28].

Conclusion

The results of this study showed that reproducibility (reliability and agreement) and internal consistency were suitable for telephone call administration to assess the physical activity level of patients with cardiovascular disease.

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Ethical Approval:

The study was approved by the Research Ethics Committee under protocol number 5.646.387.

Conflicts of interest

The authors declare no conflict of interest.

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