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# Culturally-specific Physical Activity Measures for Native Hawaiian and Pacific Islanders

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## Abstract

**Introduction:** Physical activity is an important contributor to the health disparities experienced by Native Hawaiian and Pacific Islander (NHPI) populations. A culturally-specific measurement instrument that minimizes interpretation bias is necessary to obtain accurate assessments of this lifestyle behavior. The purpose of this study was to 1) create two versions of the Pacific Islander Physical Activity Questionnaire (PIPAQ-short and PIPAQ-long) for United States NHPI, and 2) pilot test the PIPAQ instruments and two objective physical activity monitors to evaluate cultural-appropriateness and acceptability.

**Methods:** Forty NHPI adults (20M, 20F) aged 21-65 years attended focus group discussions addressing cultural perspectives related to physical activity. Feedback from participants, community leaders and physical activity experts guided cultural modifications to existing questionnaires to create PIPAQ-short and PIPAQ-long with accompanying showcards. Pilot testing of both PIPAQs and two objective physical activity monitors, the Actiheart and ActiTrainer, was carried out in another sample of 32 NHPI adults (17M, 15F) aged 18-63 years. Participants were instructed to wear one monitor for  $\geq 10$  hours/day for 7 consecutive days. At the follow-up visit, participants completed PIPAQ-short and PIPAQ-long, and a written and verbal exit interview to provide feedback on both subjective and objective instruments.

**Results:** The majority of participants felt PIPAQ-long provided a more accurate reflection of activity levels, compared to PIPAQ-short. The Actiheart was the preferred monitor due to higher comfort and lower participant burden. Self-reported duration of physical activities was most difficult to recall, compared to activity type, frequency and intensity.

**Conclusion:** Both PIPAQ instruments and the Actiheart monitor have demonstrated cultural acceptability and appropriateness for NHPI adults. Future studies will investigate the validity and reliability of both PIPAQ instruments in larger samples of NHPI adults.

## Introduction

Physical activity is an important protective factor for many of the health disparities experienced by Native Hawaiians and Pacific Islander (NHPI). However, there is currently no culturally-specific instrument that produces valid and reliable estimates of this important lifestyle behavior. The development of such an instrument is the first step towards improving health and reducing obesity-related disparities for this under-studied, high-risk population.

### Physical Activity Questionnaires

Physical activity is a complex behavior and accurate assessments obtained from subjective instruments rely on the respondent's comprehension of the multiple dimensions (i.e. duration, frequency, intensity and type) and contexts (sport and recreation, transport, occupation and household) associated with performing activities. Terminology such as "leisure-time" or "moderate-intensity" can be ambiguous and result in misinterpretation and subsequent misclassification of activity levels.<sup>1</sup> Since ethnicity influences activity recall,<sup>2,5</sup> the potential for misclassification is further exacerbated within and between different cultures and populations.

Culturally-tailored physical activity questionnaires include appropriate language and terminology, as well as culturally-relevant examples of activities that are familiar to the target audience. Therefore, the intent of each question is more clearly conveyed, which facilitates respondents' comprehension, and potentially increases recall accuracy.<sup>2,4,6,7</sup> The International Physical Activity Questionnaires (IPAQs) have been used extensively to estimate the prevalence of activity and sedentary behaviors in over 70 developed and developing countries.<sup>8-10</sup> Pacific Islander nations, however, have not been included, and researchers have issued cautions about their use in rural or low literacy populations in developing countries.<sup>11</sup> The long form of the New Zealand Physical Activity Questionnaire (NZPAQ-LF) utilizes accompanying showcards that provide examples of activities performed in different contexts. Validity testing in a multiethnic New Zealand population reported the lowest recall accuracy for Pacific Islanders ( $r=0.02$ ), compared to Maori ( $r=0.21$ ) and New Zealand Europeans ( $r=0.41$ ),<sup>12</sup> indicating the need for further cultural refinements.

### Physical Activity Monitoring Devices

Although not always possible, objective measurement techniques are preferred when assessing physical activity levels and patterns. While accelerometers and heart rate monitors have been widely used to assess free-living activity, combined measures of simultaneous heart rate and motion (HR+M) improve accuracy of estimates and correlate strongly with gold standard measures of doubly labelled water and indirect calorimetry.<sup>13-16</sup> Two novel devices that record synchronized measures of HR+M are the Actiheart (Mini Mitter/Respironics (now Philips), Bend, Oregon) and ActiTrainer (Actigraph, Pensacola, Florida). Both monitors are shown in Figure 1 and specifications are presented in Table 1. Neither monitor has been previously used or validated in the NHPI population, so critical pilot testing is required to determine cultural appropriateness and acceptability.

Without a culturally-specific, valid and reliable physical activity questionnaire, it is impossible to obtain accurate assessments, monitor trends, or determine the effectiveness of interventions aimed at promoting the adoption and maintenance of regular physical activity to address NHPI health disparities. This study's primary objective was to develop two versions of the Pacific Islander Physical Activity Questionnaire (PIPAQ-short and PIPAQ-long) for United States NHPIs. Secondary objectives were to pilot test both PIPAQ instruments, the Actiheart and ActiTrainer for cultural appropriateness and acceptability.

## Methods

Ethics approval for this pilot study was granted by the San Diego State University Institutional Review Board. The community-based participatory research approach was a partnership with NHPI leaders from two community-based organizations that assisted in planning,

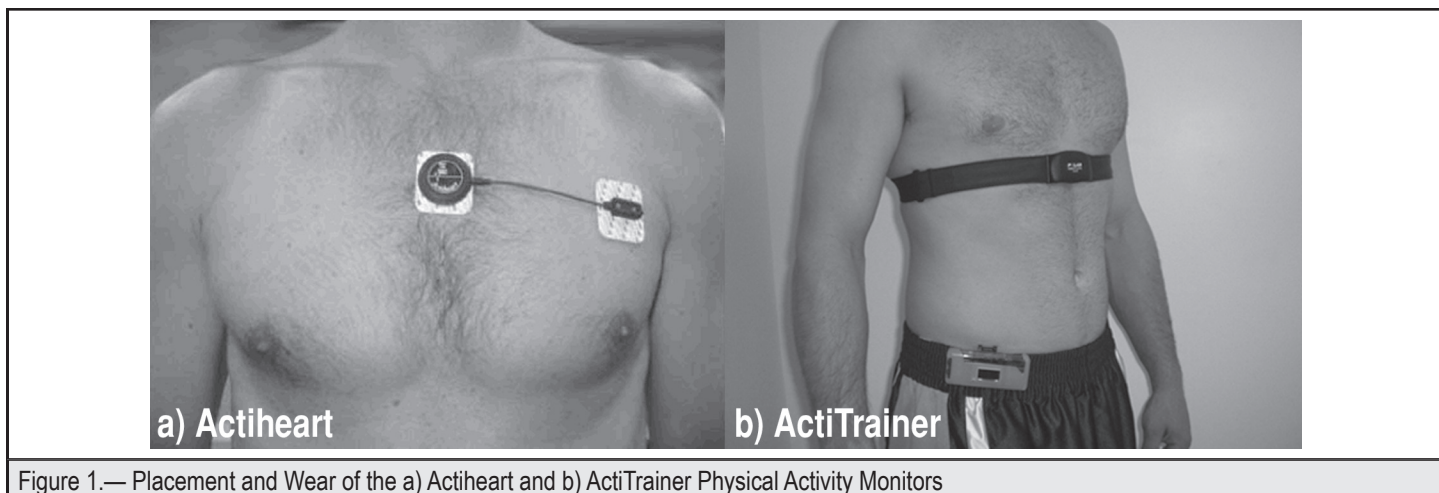


Figure 1.— Placement and Wear of the a) Actiheart and b) ActiTrainer Physical Activity Monitors

	Actiheart	ActiTrainer
Components	Single-unit that includes a main sensor and left lead connected by a 100mm. wire	Polar T31 adjustable heart rate transmitter strap; accelerometer unit
Size	Main sensor — Thickness: 0.7 cm., Diameter: 3.3 cm. Left lead — 0.5 x 1.1 x 2.2 cm.	Accelerometer — Thickness: 1.52 cm., Width: 8.56 cm., Height: 3.81 cm. Heart rate transmitter strap — 25-33 in. (+25% stretch capability)
Weight	10 g.	Accelerometer unit: 48 g. Heart rate transmitter strap: 2.3 oz.
Storage Capacity	128kb (15 days with 60s epochs)	1MB (~59 days with 60s epochs)
Rechargeable Battery	17 mAh Lithium; 3.0 volt Life: ~14 days continuous wear Recharge Time: 11 hrs	400 mAh Lithium; 4.18 volt Life: ~7-10 days for daytime only wear (depends on LED setting) Recharge Time: 2.5 hrs
Accelerometer frequency range	1-7 Hz	0.25-2.5 Hz
ECG sampling frequency	128 Hz	NA
Measurable heart rate range	31-250 bpm	40-220 bpm

implementing and reporting back to the community: the Union of Pan Asian Communities (San Diego) and the Samoan National Nurses Association (Los Angeles). NHPI adults between 21-65 years who spoke English “very well” were invited to participate in focus group discussions and pilot testing of subjective and objective physical activity measurement instruments. Community leaders screened and recruited participants through flyers and word-of-mouth at local churches and community organization meetings.

### Focus Groups

Four gender-stratified focus group discussions (~75 min each), facilitated by a NHPI community leader, were attended by N=40 (20 men, 20 women) NHPI adults. Discussions addressed cultural perspectives related to physical activity, and language interpretation was provided when necessary. Specific discussion topics included personal definitions of common terminology from physical activity questionnaires, culturally-relevant examples of activities and perceived intensities, and self-reporting of the type, duration, and frequency of activities that participants currently perform.

A combination of the IPAQ and NZPAQ-LF instruments provided the foundation for developing the PIPAQ-short and PIPAQ-long instruments. Feedback from focus group participants, NHPI community leaders and physical activity experts guided cultural modifications

to the format, terminology, and physical activity examples included in each questionnaire. The primary goal was to ensure that content validity of the PIPAQ instruments was optimized by emphasizing their ability to assess all physical activity dimensions and contexts, and produce useful estimates related to public health guidelines while maintaining interpretation of the original instruments.

### Pilot Testing

Pilot testing of both PIPAQs, the Actiheart, and ActiTrainer was conducted on N=32 NHPI adults who attended two visits at local community sites. During Visit 1, participants completed a signed consent form, received one activity monitor, and verbal and written instructions on proper application and wear. Participants were instructed to wear their respective monitors for at least 10 hours/day for 7 consecutive days, and practiced applying the monitor themselves while research staff were present. At Visit 2, data from the monitors were downloaded and scanned with the Actiheart (version 2.0) and ActiTrainer (version 3.6.0) software to determine daily wear time. Participants’ chest diameters were measured, followed by interviewer-administration of PIPAQ-short and PIPAQ-long. Written and verbal exit interviews were conducted to obtain participant feedback on both questionnaires, as well as their overall experience with their respective monitors.

Table 2.— Actiheart vs. ActiTrainer: Participant Characteristics and Mean Wear Time

	Actiheart			ActiTrainer		
	Total	Males	Females	Total	Males	Females
	N=17	N=10	N=7	N=15	N=7	N=8
Age (years)	36.3 ± 12.7	36.8 ± 12.1	35.6 ± 14.4	44.3 ± 13.1	47.9 ± 13.1	40.6 ± 12.8
BMI (kg/m <sup>2</sup> )	31.0 ± 7.5	30.0 ± 6.3	32.5 ± 9.5	31.2 ± 7.2	33.5 ± 7.0	28.5 ± 6.9
Chest circumference (in)	41.7 ± 6.4	41.6 ± 6.4	41.9 ± 7.1	43.0 ± 8.7	47.0 ± 5.0	38.5 ± 10.0
Mean wear days (out of 7)	6.5 ± 0.9	6.3 ± 1.1	6.8 ± 0.4	6.0 ± 1.7	6.0 ± 1.8	6.0 ± 1.8
Mean daily wear (hrs/day)	12.6 ± 3.2	11.2 ± 2.6	14.3 ± 3.1	10.9 ± 3.5	11.1 ± 3.9	10.8 ± 3.4
Comfort level (1-10 scale)	7.3 ± 2.4	7.2 ± 2.4	7.4 ± 2.3	6.3 ± 3.0	4.3 ± 3.4	8.0 ± 1.5

## Results

### *Creation of the Pacific Islander Physical Activity Questionnaires*

The sample of N = 40 focus group participants represented a wide age range (21–61 years) of men (35.8 ± 11.1 years) and women (33.9 ± 11.8 years) from the four largest United States NHPI subgroups: 12.5% Tongan, 52.5% Samoan, 25.0% Guamanian/Chamorro, 5.0% Native Hawaiian, and 5.0% reporting more than one race.

Similar to the IPAQ-short, PIPAQ-short asks about time spent in the moderate- and vigorous-intensity physical activity, and walking (in all contexts) over the last 7 days. However, the question ordering was changed to first address walking in order to reduce over-reporting of moderate- and vigorous-intensity physical activity.<sup>17</sup> Several key terms typically found on activity questionnaires were misinterpreted by focus group participants. For example, “resistance training”, which refers to activities purposefully performed to improve muscular strength or endurance, was mistakenly associated with a mental feeling of disapproval or opposition (i.e., “not wanting to do something”), so this term was replaced with “muscle strengthening activities”. Additionally, the terms “moderate” and “vigorous” intensity were changed to “medium” and “hard” intensity, and definitions were enhanced to include a 1–10 scale and associated physiological effects. The inclusion of physical activities performed in all contexts was elaborated upon, and culturally-relevant examples of activities were inserted. The final version of PIPAQ-short consists of 5–8 questions.

PIPAQ-long was developed by combining the IPAQ-long (10–23 questions, depending on activity level) with showcards that accompanied the NZPAQ-LF to assist with respondent comprehension and recall. These showcards were modified to represent common physical activities performed by United States NHPI, categorized by intensity and context (sport and recreation, occupation, household, transportation), as well as muscle-strengthening and sedentary behaviors (e.g., watching television, working a desk job, computer use, reading, lying down, etc.). Based upon focus group discussions, a total of 30 sport and recreational activities were omitted from the original showcards since less than 25% of focus group participants reported participation in their lifetime. Three activities were added: dodgeball, racquetball, and kickball.

### *Pilot Testing*

A sample of N = 32 (17 men, 15 women) NHPI adults, aged 18–63 years (40.3 ± 13.3) participated in pilot testing of both PIPAQs, the

Actiheart, and ActiTrainer monitors. The sample represented the diversity of United States NHPI subgroups (9.3% Tongan, 53.0% Samoan, 21.9% Guamanian/Chamorro, 9.4% Native Hawaiian, and 6.3% reporting more than one race), and was classified as obese with a mean body mass index (BMI) of 31.1 ± 7.2 kg/m<sup>2</sup>.

Equal numbers of men and women wore the Actiheart (10 men, 7 women) or ActiTrainer (7 men, 8 women) monitor, and no significant differences in participant characteristics were observed between groups that were assigned different monitors. Table 2 presents participant characteristics, average wear time, and comfort levels according to assigned monitors. Overall, Actiheart was worn longer (6.5 ± 0.9 days for 12.6 ± 3.2 hrs/day) than ActiTrainer (6.0 ± 1.7 days for 10.9 ± 3.5 hrs/day). No significant gender differences were observed for either monitor.

Based on a 1–10 scale, participants reported overall comfort levels that were slightly higher for Actiheart (7.3 ± 2.4) compared to ActiTrainer (6.3 ± 3.0) (Table 2). Interestingly, men who were required to shave their chests for Actiheart wear reported higher comfort levels (7.2 ± 2.4) compared to men who wore ActiTrainer (4.3 ± 3.4), and the highest overall comfort levels were reported by women wearing the ActiTrainer (8.0 ± 1.5). During exit interviews, the majority of ActiTrainer wearers reported the heart rate transmitter strap was “too small” (mean chest circumference of men and women wearing the ActiTrainer were 47.0 ± 5.0 and 38.5 ± 10.0 inches, respectively). Adverse skin reactions were reported by 4 ActiTrainer wearers (1 man, 3 women). These were minor skin rashes that occurred after 4–5 days of consecutive wear, although 1 participant developed a rash on her second day of wear. Two Actiheart wearers (1 man, 1 woman) also reported minor skin irritation due to adhesive electrodes, which occurred during the last 2 days of wear.

Feedback on self-report instruments was obtained after participants completed both PIPAQ instruments. Using a scale of 1–10, participants rated the difficulty of accurately recalling activity type, frequency, intensity, and duration. While no significant gender differences were observed, recall of activity duration ranked highest in level of difficulty (4.7 ± 3.1) among men and women. Activity type, frequency, and intensity were all ranked similarly (3.3 ± 2.7). In regard to cultural acceptability of the PIPAQ instruments, the overall consensus was that the additional detail and accompanying showcards of PIPAQ-long allowed participants to provide a more accurate reflection of their activity levels, compared to PIPAQ-short.



## Discussion

Physical activity represents a critical lifestyle behavior that is linked to most chronic diseases that disproportionately affect ethnic minority populations, notably NHPIs. This is the first published study to develop and test the comprehension and acceptability of subjective physical activity questionnaires (PIPAQ-short and PIPAQ-long), as well as the feasibility of two objective measurement devices (Actiheart and ActiTrainer) in NHPI populations. While the IPAQ instruments have been widely used and validated for many countries and cultural groups, this is not true for NHPIs. Based upon focus groups conducted in this study, many changes need to be made to the IPAQ to improve comprehension and potential validity for NHPIs. Thus, the PIPAQs were created with extensive community input, and initial pilot testing indicated that both were feasible with participants favoring the PIPAQ-long over the PIPAQ-short. Future studies will investigate the validity and reliability of both PIPAQ instruments in larger samples of NHPI adults. Once validated, baseline activity data for United States NHPIs can be used to monitor physical activity and sedentary behaviors, determine trends, and measure the effectiveness of interventions in this high-risk population.

Data on participant adherence to, and feedback from wearing the Actiheart and ActiTrainer monitors, indicated that while both were acceptable to NHPI adults, comfort levels and mean days of wear were higher for the Actiheart. Although both objective activity monitors record simultaneous HR+M data, their designs were different. The Actiheart, a small single-unit device that is worn on the chest and secured by adhesive electrodes, was preferred over the ActiTrainer, which consisted of a separate heart rate monitor strap worn around the chest, and an accelerometer unit worn at the hip. The identification of a culturally-accepted monitor will serve as the criterion measure of physical activity to validate self-reported measures. If PIPAQ-short and PIPAQ-long show acceptable validity and reliability, these culturally-specific instruments could be used to provide valuable physical activity assessments for baseline and evaluation purposes. Indeed, the results from this pilot study set the stage for a full-scale PIPAQ validity and reliability study, a necessary 'next step' for providing NHPIs with a culturally-specific instrument to improve the accuracy of this important lifestyle behavior.

Lastly, this study could not have been conducted without involvement of community leaders in the development and implementation of study activities. NHPI community leaders from trusted community-based organizations provided valuable input into the cultural modifications to the IPAQ and NZPAQ-LF instruments, recruited eligible adults to participate in focus group discussions and pilot testing, and provided the space to carry out data collection activities. In formative research such as this, where no immediate community benefit is provided, we believe NHPI adults participated solely based upon the reputations of the leaders and organizations. We hope future studies will build upon this research to understand the psychosocial and environmental determinants of physical activity, the correlations of physical activity with other factors (e.g., diet and nutritional intake), and the effectiveness of culturally-tailored physical activity interventions for NHPI adults in the United States. Such efforts are being undertaken by other partners in the WINCART network, with the overall goal of reducing and eliminating enduring chronic disease disparities for NHPI communities.

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