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Development and validation of AIMFREE: Accessibility Instruments Measuring Fitness and Recreation Environments

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Abstract

Purpose: The purpose of this study was to develop and validate a series of 16 survey instruments measuring fitness and recreation accessibility, collectively referred to as AIMFREE (Accessibility Instruments Measuring Fitness and Recreation Environments). General domains of assessment included the built environment, equipment, programmes, policies, and training and behaviour.
Methods: Fitness and recreation professionals ($n = 35$) assessed fitness centres/swimming pools ($n = 35$) in nine regions across the US. Rasch analysis was used to assess the psychometric properties of the instrument.
Results: The AIMFREE evidenced adequate to good fit to the Rasch model and adequate to good internal consistency ($r = 0.70 - 0.90$). Test-retest reliability ranged from 0.70 (entrance areas) to 0.97 (swimming pools). Analysis of differential item functioning indicated that item calibrations generally did not differ significantly between urban and suburban environments.
Conclusion: The AIMFREE instruments demonstrated adequate to good fit to the Rasch model with several of the subscales demonstrating well to excellent separation of facility accessibility.

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Introduction

The vast majority of Americans with disabilities are not obtaining the recommended amount of physical activity needed to confer health benefits and prevent secondary conditions associated with a sedentary lifestyle (e.g., heart disease, obesity, osteoporosis).[1–5] The risk to this population from secondary conditions associated with inactivity is particularly acute, as persons with disabilities are far more likely to have significantly lower levels of overall activity. The current version of the *Healthy People 2010* report[5] notes that significantly more people with disabilities reported having *no* leisure-time physical activity, 56% vs. 36%, compared to people who did not indicate they had any disability. The HP 2010 Chapter 6, *Disability and Secondary Conditions*, suggests that the significantly lower rate of participation among people with disabilities may be related to environmental barriers, including architectural barriers, organizational policies and practices, discrimination, and social attitudes, and recommends that public health agencies begin to evaluate which environmental factors enhance or impede participation.

Most local and state parks, fitness centres, health clubs, spas, gyms, playgrounds, pools, trails and sports fields are *unfriendly* environments for many people with disabilities because of their lack of accessibility.[6–10] In a conference sponsored by the Centers for Disease Control and Prevention, National Center for Medical Rehabilitation Research, and others, an expert panel wrote: 'Many fitness clubs and YMCAs are not prepared to educate or support adults with a physical disability in an appropriate fitness programme; most do not even have appropriate equipment. And yet, because fitness programmes are important in preventing

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cardiovascular disease, reducing stress, and improving mental outlook, they would be very helpful to those with disabilities'.[11]

While exercise seems to be a universal recommendation for maintaining good health, for people with disabilities, options for exercise may be seriously limited by a lack of accessible equipment and facilities, a lack of information about what type of exercise is best for them, or the severity of their physical impairment itself.[12] In order to maintain a higher quality of life, preserve physical independence into later adulthood, and prevent secondary conditions, people with disabilities must be given access to the same range of fitness, leisure and recreational facilities available to most Americans. Instruments that can provide valid and reliable measures of the accessibility of these environments are the first step toward providing this access. Given the rapidly developing focus in research, public policy and practice on the role of the environment in determining participation in physical activity, there is a need to establish objective measurement instruments that can assess the environment. However, relatively few instruments are available for measuring fitness and recreation facility accessibility. The present study was undertaken to develop a series of valid, reliable and generalizable instruments that could be used to evaluate the accessibility of fitness and recreation facilities for people with disabilities. This set of instruments is collectively called AIMFREE (***A***ccessibility ***I***nstruments ***M***easuring ***F***itness and ***R***ecreation ***E***nvironm***e***nts).

Methods

PARTICIPANTS AND TEST SITES

Fitness and recreation professionals ($n = 35$, 10 males, 25 females) were recruited for this study to visit and rate fitness centres from 10 geographic regions. At least one rater in each region, called the 'gold-trained rater,' was selected and trained by the present investigators in the use of the AIMFREE instruments. Gold-trained raters included 11 fitness professionals (three males, eight females), and were brought in to participate in a 2-day training session to learn how to use the surveys and carry out the validation protocol. To be eligible to serve as a gold-trained rater, prospective participants had to meet the following criteria: (1) be a professional in the area of fitness, recreation, or rehabilitation, and (2) have experience related to persons with disabilities in the area of fitness or recreation. Prospective gold-trained raters were identified through (1) Americans with Disabilities Act (ADA) Technical Assistance Centres located in 10 regions throughout the US, (2) membership list of the American College of Sports Medicine, and (3) fitness and recreation professionals who have called the National Centre on Physical Activity and Disability (NCPAD). Additional fitness professionals were then recruited and trained by each gold-trained rater within each geographic region to perform assessments of participating facilities.

Test sites

A total of 35 facilities (19 in urban areas, 16 in suburban areas) were identified and assessed. Facilities were selected in order to represent both urban and suburban areas throughout the US. We divided the US into 10 regions (see figure 1). Facilities were then identified in each region by gold-trained raters. Due to the dropout of gold-trained rater in Region 9 (Arizona, California and Nevada), only facilities in the remaining 9 geographic regions were sampled. To be eligible for the study, each facility had to meet the following inclusion criteria: (1) self-identify as being a fitness centre; (2) contain a swimming pool; (3) have one or more pieces of cardiovascular and/or strength training exercise equipment; (4) have at least one staff member who agreed to participate in the study; and (5) be located in either a suburban or urban environment. Facilities in rural regions were not sampled because of the time and cost involved in travelling to these areas as well as difficulties in identifying facilities in these areas. The 35 assessed facilities included 16 for-profit facilities, 5 community centres, 4 recreation centres, 3 wellness centres, 2 rehabi-

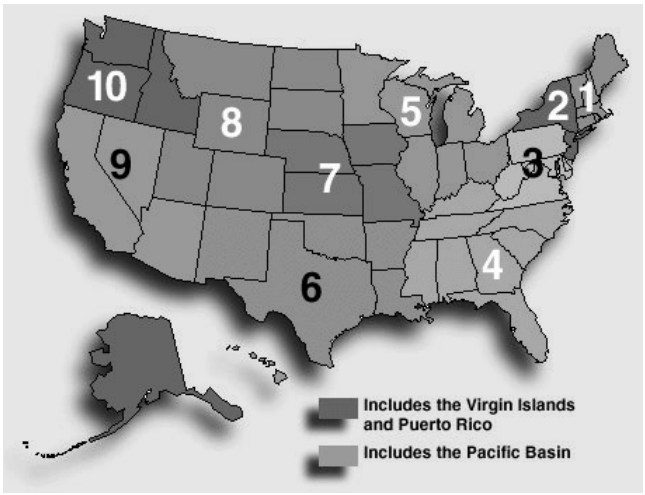

Figure 1 Map showing regions of the USA where field testing occurred.

litation-based facilities, 2 aquatic centres, 2 college-based facilities and 1 hospital-based centre.

INSTRUMENT DEVELOPMENT

The AIMFREE instruments were developed to measure the accessibility of fitness and recreation facilities as it pertains to persons with mobility impairments (e.g., persons using wheelchairs or other assistive devices). Efforts were also made to include items that were relevant to persons with other disabling conditions, including individuals with sensory impairments (e.g., size of print on facility signage). The current version of AIMFREE instruments was not designed to measure accessibility for persons with cognitive disabilities.

Instrument development occurred in three phases: (1) setting selection, which involved identifying the types of fitness and recreation facilities of greatest interest to persons with disabilities; (2) item development; and (3) instrument piloting.

Setting selection

The selection of the *type* of facilities to be assessed was based on a national survey involving persons with disabilities. Respondents were asked to evaluate each of 30 types of fitness and recreation facilities (i.e., bowling alleys, parks, tennis courts, etc.). Interest, usage and perceived accessibility of fitness and recreation facility types were assessed. Surveys were sent to 1000 individuals with disabilities across the US. Questions addressed the following areas: (1) interest in participating in various types of fitness and recreation facilities, (2) current usage of fitness and recreation facilities, and (3) perceived accessibility of these types of facilities. Completed surveys were returned from 361 respondents. Types of facilities were selected for instrument development with the highest mean interest and usage ratings, particularly those with high interest and medium to low perceived accessibility. Based on these criteria, fitness centres and swimming pools were selected because of their high preference rating by people with disabilities.

Item development

In order to develop survey items, focus groups were conducted in 10 regions across the USA to identify environmental factors related to fitness/recreation centre access. In each region, four focus groups were held, each consisting of (1) persons with disabilities (primarily mobility impairments), (2) fitness and recreation professionals, (3) architects, and (4) city planners and park district managers. People with disabilities were instructed to focus on perceived barriers and facilitators to fitness/recreation centre participation, including internal (e.g., psychosocial factors such as lack of motivation) and external (e.g., lack of environmental resources such as transportation) factors. Fitness and recreation professionals and staff were instructed to discuss issues related to the access and use of equipment, access *to* and participation *in* fitness/recreation programmes, and systems and policies (i.e., policies related to persons with disabilities). Members of this group also discussed the knowledge, skills and attitudes of fitness/recreation professionals and staff that may help or hinder persons with disabilities accessing a fitness/recreation centre or programme. City and park district managers were instructed to discuss factors related to access of the facility and access to and participation in the fitness programme. Similarly, architects and facility planners identified barriers and facilitators related to access of the facility. Each focus group session lasted 2 h.

Group facilitators guided discussions and maintained a working list of identified barriers and facilitators. Each focus group session was audiotaped. After all focus groups met, Aday's[13] guidelines were used for developing and formatting closed questions. Focus group data, including notes and audiotapes, were analysed to identify various barriers and facilitators to fitness and recreation facility accessibility. Additional information was also obtained through review of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and guidelines developed and proposed by the US Access Board that pertain to fitness and recreation facilities.[6] This information, along with the focus group data, were used to create a series of 16 subscales as shown in table 1.

Following initial item development, items were reviewed for clarity by the research team as well as an expert panel that consisted of 6 professionals involved in the areas of accessibility, fitness and recreation, and survey design. Table 2 presents sample items from each of these subscales.

INSTRUMENT VALIDATION

Procedures

Each facility was assessed by (1) a trained professional evaluator (gold-trained rater), and (2) a second fitness professional recruited by the gold-trained rater. Each gold-trained rater assessed all facilities within his or

Table 1 Description of the AIMFREE subscales

Subscales	*Items*	*Description*
General measures of accessibility		
Bathrooms	35	Accessibility of bathroom entrance, toilet stalls and sink areas
Elevators	24	Accessibility of elevator entrance, controls; provision of information (e.g., audible and/or visual cues) regarding floor position and direction
Entrance areas	50	Accessibility of access routes leading to the facility, entrance doorways and front desk area
Parking lot	15	Accessibility of parking lot areas, including access routes between parking and the facility
Telephones	9	Accessibility of facility telephones
Water fountains	9	Accessibility of facility water fountains
Fitness centre-specific measures of accessibility		
Equipment	60	Accessibility of exercise equipment and equipment area
Fitness programme	10	Accessibility of group fitness programmes (e.g., aerobics class)
Hot tubs/saunas	18	Accessibility of hot tubs, whirlpools and saunas
Information	26	Accessibility of signage, brochures and other facility-related information
Locker rooms	44	Accessibility of locker room and shower areas
Policies	56	Availability and implementation of facility policies that foster inclusion of persons with disabilities in the facility
Professional behaviour	20	Behaviour of facility staff that either promotes or hinders participation of persons with disabilities in the facility and its programmes
Professional knowledge/attitudes	11	Staff attitudes towards persons with disabilities and knowledge concerning disabilities and adaptive exercise equipment
Professional support and training	16	Information resources and opportunities for continued training for staff members in areas related to or affecting persons with disabilities.
Swimming pool	54	Accessibility of the swimming pool and swimming pool area

Table 2 Sample items from the AIMFREE subscales

Subscales	*Sample items*
General measures of accessibility	
Bathrooms	Is there an unobstructed turning radius of at least 60 inches in front of restroom doors? Is the sink counter 34 inches or less above the floor?
Elevators	Is there a visual signal on each floor indicating which elevator is approaching? Is the width of the elevator car at least 80 inches?
Entrance areas	Are access routes free from cracks, gaps, lips or raised edges?
Information	Do room identification signs have raised characters or symbols? Do televisions and other multimedia employ opened/closed captioning?
Parking lot	Do parking spaces that are designated as accessible have an access aisle adjacent to the parking space?
Telephones	Are Telecommunication Devices for the Deaf (TDD) identified with the appropriate signage? Is the coin slot located 48 inches or less from the floor for front approach or 54 inches or less for side approach?
Water fountains	Is the spout height 36 inches or less as measured from the floor to the spout outlet? Do water fountain units protrude less than 4 inches into the room or hallway?
Fitness-centre specific measures of accessibility	
Equipment	Does the facility provide exercise equipment that does not require transfer from wheelchair to machine? Are buttons on equipment raised from the panel surface?
Fitness programme	Can individuals with disabilities participate in fitness/recreation programmes at their own pace? Do exercise classes and programmes (e.g., aerobics classes) include activities that can be performed from a seated position?
Hot tubs/saunas	Is there a ramp leading into the whirlpool or hot tub? Is there a place to park a wheelchair outside the sauna so it doesn't get hot?
Locker rooms	Is there a clear path leading from the locker room entrance to the lockers that is at least 36 inches wide? Can the highest lockers be opened from a seated position?
Policies	Is the accessibility of the facility periodically reviewed? Can a consumer's personal assistant be allowed to enter the facility without incurring additional charges?
Professional behaviour	Did the staff member make eye contact when speaking to consumers? Did staff members ask consumers if they needed assistance before attempting to help them?
Professional knowledge/attitudes	Did you feel that staff members were uneasy with regard to consumers' disability? Did you feel that staff members maintained a positive attitude when interacting with consumers?
Professional support and training	Do staff members receive training on providing accommodations to persons with disabilities? Do staff members receive basic information on medications and their effect during exercise?
Swimming pool	Are pool lift controls accessible from the deck level? Does the pool have a ledge to hold onto when entering the water?

her region. In order to determine test-retest reliability of the instruments, each gold-trained rater selected one facility in his or her respective region to re-assess 2 weeks following the initial assessment. On most of the AIMFREE subscales, raters were required to answer items based on direct observation of the facility. A few subscales, such as the fitness programme, policies and professional support and training subscales, required that the rater obtain information from staff located at the facility.

A common problem encountered in instrument development was related to the issue of obtaining equal-interval measurements from items measuring discrete categories (e.g., 'good,' 'very good,' 'excellent'). Whereas aggregating items into a composite or total score is common practice, aggregate scores based on responses to Likert-type items are ordinal numbers. This makes valid comparisons between facilities or items difficult, as equal score differences between different pairs of points on an ordinal scale do not imply equal amounts of the construct under investigation. Another limitation with the comparison of raw scores is that these comparisons will always depend on which items are administered, and, if norms are used, which sample of subjects provided the norms.

The Rasch measurement model[14–17] overcomes these limitations with ordinal data. It assumes that the probability of a given subject/item interaction (e.g., 'pass' vs. 'fail') is governed by the item's difficulty and the subject's 'ability'. According to the Rasch model, the more the subject's ability overcomes the item's difficulty, the higher the probability is for the subject to achieve a pass rather than a fail score on that item. Conversely, the more the item's difficulty exceeds the subject's ability, the greater the probability is for the subject to fail the item. When items and subjects interact in this manner, they are said to 'fit' the Rasch model.

Fit to the Rasch model also implies that the set of items measure a single construct or trait. The ability to measure a single construct with a hierarchically arranged set of items offers additional advantages. It allows practitioners to quickly see areas of strengths and weaknesses with respect to a facility's accessibility. It is also well suited for the development of computerized adaptive tests (CAT) that can provide accurate assessments while reducing respondent burden. Rasch analysis of the AIMFREE instruments involved the assessment of three key areas: (1) unidimensionality, (2) targeting item difficulty to facility accessibility, and (3) differential item functioning. Unidimensionality was assessed by calculating item calibration and fit statistics for sets of items thought to represent a single construct. Targeting was assessed by creating item maps that displayed item difficulty and facility accessibility calibrations on the same linear scale. Differential item functioning was used to evaluate the stability of the constructs and to determine if the instruments had to be normed separately for each subscale. All analyses were performed using WinSteps 3.35 for Windows (Chicago, IL).[18]

Results

UNIDIMENSIONALITY OF CONSTRUCTS

Examination of item fit statistics (table 3) indicates that all subscales evidenced good fit to the Rasch model with the exception of the Telephone subscale, which had high item mean square outfit statistics indicating that one or more items on these measures was prone to idiosyncratic responses.

Principal components factor analyses (PCA) were performed to determine if meaningful and substantive dimensions were present within measurement variance that was not explained by the Rasch measurement model. The results of these analyses indicated that the parking lot and fitness programme subscales showed evidence of multidimensionality. Four of the items on the parking lot subscale that loaded negatively onto factor 1 appeared to be related to issues that were ancillary to parking lot access (e.g., location of catch basins in parking lot area, ability to reach parking ticket machine from a seated position). These items were also the more difficult items in the parking lot subscale. With respect to the fitness programme subscale, items of average difficulty loaded positively on factor 1, whereas items of very low or very high difficulty loaded negatively on factor 1. No evidence of multidimensionality was found for any of the other AIMFREE subscales.

INTERNAL CONSISTENCY

Internal consistency refers to the ability of the measure to reliably distinguish between varying levels of a construct (e.g., accessibility). As shown in table 3, internal consistency ranged from 0.0 to 0.89, with 8 of the 16 subscales evidencing adequate to good internal consistency (swimming pool, professional behaviour, policies, equipment, information, bathroom, professional support and training and elevators). Among the remaining 8 subscales, 2 (parking lot, fitness programme) showed evidence of multidimensionality, and the mean facility score on the parking lot and

Table 3 Rasch analysis of the AIMFREE subscales

		Facilities					*Items*			
Subscale	*Items*	*Mean*	*SD*	*Rel.*	*Infit NNSQ (SE)*	*Outfit MNSQ (Z)*	*Infit MNSQ (Z)*	*Outfit MNSQ (Z)*	*Rel.*	*Test-retest*
Swimming pool	45	− 0.10	1.31	0.89	1.01 (− 0.3)	1.08 (− 0.2)	0.95 (− 0.2)	1.08 (0.1)	0.96	0.97
Professional behaviour	17	2.78	2.27	0.85	0.97 (− 0.2)	0.93 (− 0.2)	1.05 (− 0.1)	1.16 (− 0.1)	0.93	–
Policies	52	0.76	0.98	0.82	0.99 (− 0.1)	0.94 (− 0.2)	1.00 (0.0)	0.95 (− 0.2)	0.90	–
Equipment	53	− 0.15	0.93	0.80	0.99 (− 0.2)	1.02 (− 0.2)	1.00 (− 0.1)	1.03 (− 0.1)	0.96	0.94
Elevator	21	2.02	1.68	0.75	0.99 (− 0.1)	0.91 (− 0.1)	0.98 (− 0.1)	1.08 (0.0)	0.93	0.91
Information	23	− 0.03	1.31	0.75	1.01 (− 0.1)	0.98 (− 0.2)	0.98 (− 0.1)	0.97 (0.0)	0.96	0.72
Bathroom	30	1.67	1.40	0.71	0.98 (− 0.2)	1.01 (− 0.2)	0.97 (− 0.1)	1.01 (0.0)	0.98	0.90
Professional support and training	16	− 0.20	1.26	0.70	1.01 (0.0)	0.98 (− 0.1)	0.99 (0.0)	0.98 (0.0)	0.79	–
Locker room	36	1.03	0.86	0.63	1.01 (0.0)	0.95 (− 0.2)	0.99 (0.0)	0.94 (− 0.1)	0.95	0.72
Telephone	6	0.38	2.51	0.61	0.79 (− 0.3)	0.71 (− 0.2)	0.97 (− 0.3)	1.87 (− 0.2)	0.94	0.96
Entrance areas	41	1.31	0.69	0.43	0.99 (− 0.1)	1.10 (− 0.1)	1.00 (− 0.1)	1.10 (− 0.1)	0.88	0.70
Hot tubs/saunas	13	− 1.41	1.30	0.43	0.99 (− 0.1)	0.96 (− 0.3)	0.97 (0.0)	1.05 (− 0.2)	0.91	0.95
Water fountain	7	1.00	1.14	0.14	0.98 (− 0.1)	1.09 (− 0.1)	0.98 (− 0.1)	1.08 (0.0)	0.85	0.77
Parking lot	10	1.76	1.06	0.00	0.98 (− 0.2)	0.93 (− 0.2)	1.00 (0.0)	0.89 (− 0.2)	0.90	0.95
Fitness programme	8	1.15	0.99	0.00	0.99 (− 0.2)	0.86 (− 0.3)	1.00 (− 0.1)	0.86 (− 0.3)	0.83	–
Physical assessment	285	0.63	0.58	0.90	1.01 (0.0)	1.01 (− 0.2)	1.00 (0.0)	1.01 (0.0)	0.94	

entrance areas subscales were 1.7 and 1.9 standard deviation units above their respective instrument means of zero indicating that the items in both of these measure were quite easy to endorse. There were 3 subscales (parking lot, locker room and entrance areas) that also evidenced homogeneity in facility accessibility. The entrance area subscale had a measurement range (i.e., from the easiest to the most difficult item) from − 3.28 to 3.21, yet facility accessibility scores on this measure ranged from − 0.74 to 2.77, suggesting that facilities tended to fall within the above average range. Similarly, whereas the measurement range of the locker room subscale was from − 2.42 to 5.40, facility scores on this measure ranged from − 0.64 to 3.08, less than half the range of the instrument. Hence, internal consistency may have been higher on these subscales had a more heterogeneous sample of facilities been assessed. Other subscales, such as telephone, hot tubs/saunas, and water fountain consisted of relatively few items (less than 15), which accounts at least in part for the lower internal consistency.

FACILITY FIT AND MATCH WITH INSTRUMENTS

Mean scores for the AIMFREE subscales or the facilities in the validation sample ranged from − 1.02 to 2.78. The matching of facilities with items is illustrated graphically in figure 2, which shows variable maps for 6 of the AIMFREE subscales: swimming pool, equipment, policies, elevators, information, and bathrooms. Whereas mean item difficulty and mean facility scores were well matched on the swimming pool, equipment, policies and information subscales, mean facility scores were higher than item difficulty for the elevator and bathroom subscales. Differences between item means and facility means ranged from 0.03 to 2.78. All of the mean facility scores fell within two standard deviations of mean item difficulty. Whereas the hot tub/sauna subscale appeared to be a more difficult subtest ($M = -1.41$), the professional behaviour, elevators, bathroom and parking subscales were found to be relatively easy subtests.

TEST-RETEST RELIABILITY

Test-retest reliability over a 2-week period was assessed on all subscales except those requiring input from staff working in the facility (i.e., policies, professional behaviour, professional support and training, and fitness programme). Intraclass correlations of Rasch scores ranged from 0.70 (access routes) to 0.97 (swimming pools).

DIFFERENTIAL ITEM FUNCTIONING FOR URBAN AND SUBURBAN FACILITIES

Item difficulty calibrations were compared between urban and suburban environments. The results of this analysis are shown in figure 3. There was little evidence of item difficulty differences between urban and suburban environments. On the professional behaviour subscale, one item (*did staff members provide good ideas*

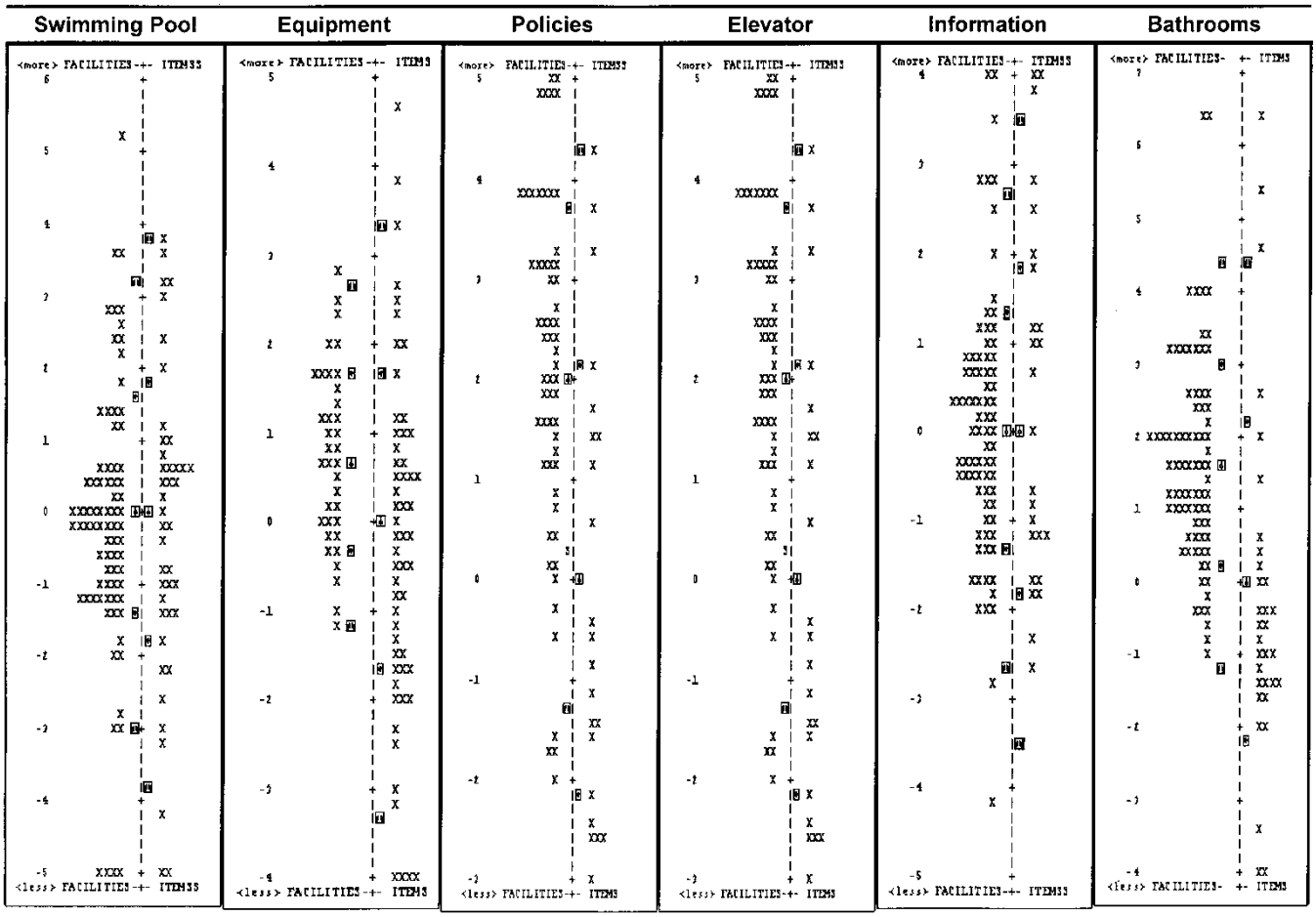

Figure 2 Variable maps for six of the AIMFREE subscales.

on improving fitness?) was found to be significantly more difficult in urban environments than in suburban environments, though in both cases the item was of above average difficulty. These findings generally indicate that the AIMFREE instruments and scoring can be used in both urban and suburban environments.

Conclusions

Few studies to date have systematically examined the accessibility of fitness and recreation facilities. Most of the previous work in this area has focused primarily on aspects of the built environment and equipment.[19, 20] The present study expands upon this earlier empirical work by developing a set of instruments that measure the accessibility of fitness and recreation environments across several domains (i.e., built environment, equipment, professional behaviour, professional support and training, facility policies and programmes), and with generalizability across urban and suburban environments. These results support the use of the AIMFREE instruments in providing reliable and valid quantitative descriptions of facility accessibility for persons with physical disabilities. This is particularly important given that the only instruments that are currently available to assess a fitness or recreation facility's accessibility are ADA-type checklists that focus primarily on the built environment. The AIMFREE instruments focus on other areas of accessibility that can also impact a person's ability to have a successful experience in a fitness or recreation facility. In particular, the subscales most relevant to enhancing the participation of persons with physical disabilities in physical activity include measures of accessibility for the swimming pool, equipment area, professional behaviour and fitness centre policies. Members of both professional and consumer focus groups frequently cited concerns regarding these domains or areas of accessibility as major barriers to

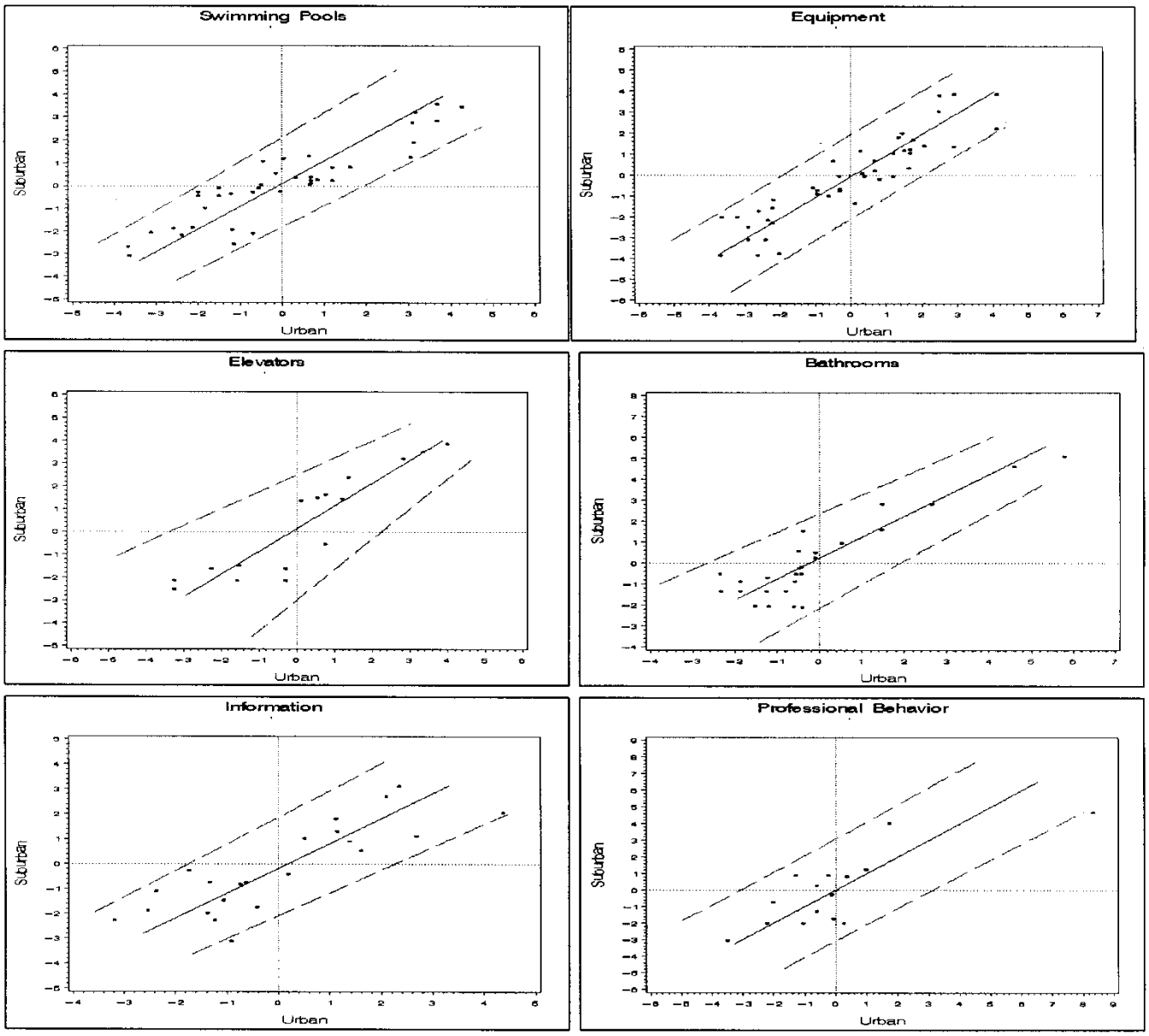

Figure 3 Differential function plots comparing item calibrations for urban and suburban environments on 6 of the AIMFREE subscales.

using these facilities. Comparisons of the various types of facilities (i.e., rehabilitation, university, hospital, for-profit, community centres, wellness centres) revealed that rehabilitation-based facilities had markedly higher levels of accessibility as indicated by several of the AIMFREE subscales compared to other facilities. Though this finding is based on a relatively small number of facilities, it does lend further support to the validity of the AIMFREE instruments.

A limitation of this study is that a few of the subscales within the AIMFREE instruments did not perform as well psychometrically. The parking lot and entrance area subscales were easy to endorse among the facilities sampled. It is difficult to determine whether this was due to characteristics of the facilities sampled or that existing legislation regarding accessibility (e.g., ADA) has resulted in significant improvement in the accessibility of these areas. Conversely, facilities were found to

perform at a below-average level on the hot tub and sauna subscale, an area presently not covered by ADA guidelines. Furthermore, this measure as well as the telephone subscale contained items that tended to be responded to in an idiosyncratic manner. Homogeneity of facility scores was also a factor for the parking lot, entrance areas and locker room subscales.

The use of the Rasch measurement model for the scaling and evaluation of the AIMFREE instruments has a number of advantages. First, in addition to obtaining an equal-interval measurement of a facility's level of accessibility in a particular area, the hierarchical arrangement of items allows facility owners and professionals to understand the strengths and weaknesses of a facility with respect to its accessibility. The use of item maps and similar graphic methods allow professionals to identify what action steps need to be taken to improve facility accessibility. Second, the Rasch measurement model lends itself well to the development of computerized adaptive testing (CAT) versions of the AIMFREE instruments. The advantages of CAT administration is (a) reducing respondent burden when completing the instruments by administering only those items that are most relevant to the facility's level of accessibility, and (b) allowing the respondent to tour the facility and make necessary observations or ancillary measurements while completing the instruments with the use of portable computers (e.g., PDAs).

Future research is needed to develop instrument norms of facility accessibility. Further data collection with low, moderate and high accessibility facilities is critical both for the development of accurate norms and for making people with disabilities aware of facilities that may have greater levels of accessibility. Instruments that evaluate accessibility issues related to people with cognitive disabilities are also needed.

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