

Exercise Barrier Severity and Perseverance of Active Youth With Physical Disabilities

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Purpose: The authors investigated perceived exercise and physical activity barriers of active youth with physical disabilities. **Research Method/Design:** A 46-item exercise barrier instrument was administered to 145 youth (117 boys and 28 girls, 12 to 19 years of age). Using the Rasch model, the authors estimated barrier severity and youths' exercise perseverance. Model–data fit was determined by Infit and Outfit statistics (≥ 0.5 and ≤ 1.5). **Results:** Except for 1 item, the model fit the data well. The most difficult barriers that youth with physical disabilities faced were lack of time and pain or discomfort. The older youth demonstrated higher exercise perseverance than the younger youth. There were no differences in youths' exercise perseverance scores by gender or National Wheelchair Basketball Association classification. **Implications:** Removing severe barriers should be a part of future exercise and physical activity interventions targeting this population.

Keywords: barriers, exercise, physical activity, Rasch model, youth

An estimated four million children, or 6.1% of the U.S. population under 18 years of age, have disabilities, according to a 1996 report by the National Institute on Disability and Rehabilitation Research (Wenger, Kaye, & LaPlante, 1996). Disease and disorders accounted for 58.4% of disabling conditions, and impairments accounted for the remaining 41.6%. Furthermore, the proportion of the U.S. population with disabilities has risen markedly during the past quarter-century, according to another National Institute on Disability and Rehabilitation Research report (Kaye, LaPlante, Carlson, & Wenger, 1996). Besides a gradual change resulting from the increased aging population, the dramatic increase is believed to be caused by rapidly increasing disability rates for youth since 1990.

Regular participation in exercise and physical activity is a vital lifelong behavior that has many benefits, such as increases in immune function, strength, and flexibility, and decreases in depression and anxiety (see, e.g., Bouchard, Shephard, & Stephens, 1994; Petruzzello & Landers, 1994). Similarly, a lack of exercise has negative health consequences (Powell, Thompson, Casperson, & Kendrick, 1987). Unfortunately, population-based surveys consistently have shown that persons with disabilities are less likely to be physically active; thus, understanding barriers to exercise and

physical activity among persons with disabilities needs immediate exploration (Heath & Fentem, 1997).

Perceived exercise barriers that inhibit people from participating in exercise and physical activity on a regular basis have been considered one of the most common psychological determinants or correlates in determining people's physical activity behaviors (Dishman, 1994; Steinhardt & Dishman, 1989). In fact, perceived barriers and their roles in determining physical activity participation have been explored in several health behavior theories, such as the Health Belief Model, Transtheoretical Model, and social–cognitive theory (DuCharme & Brawley, 1995; Gorely & Gordon, 1995; Slenker, Price, Roberts, & Jurs, 1984).

Efforts made to develop instruments to measure perceived exercise barriers mainly have been on people without disabilities. For example, Stutts (2002) examined the determinants of physical activity in the adult population and identified lack of time as a prime barrier for inactivity. Johnson, Corrigan, Dubbert, and Gramling (1990) observed women's perceptions of the barriers to participate in exercise and weight control practices. They found that lack of time was the most significant barrier to exercise, and lack of willpower and time constraints were the obstacles to weight management. Zhu, Timm, and Ainsworth (2001) identified women's exercise barriers and perseverance. A 23-item barrier instrument was administered to 479 female adults in the study. The three most severe exercise barriers were lack of self-discipline, lack of time, and lack of blocks of time. Eyler and Vest (2002) explored environmental and policy factors related to physical activity among rural White women. The results of the discussion from the focus groups showed that lack of access to places to exercise and safety concerns were common environmental and policy barriers. Rhodes et al. (1999) reviewed the literature concerning factors associated with exercise adherence among older adults. Twenty-

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seven cross-sectional and 14 longitudinal studies with a minimum mean age for the participants of 65 years were included. Perceived physical frailty and poor health were considered the major barriers to exercise adoption and adherence in older persons. Finally, Tappe, Duda, and Ehrwald (1989) examined the perceived barriers of children and adolescents. Nine perceived barriers were identified through a pilot study in which children were asked to state perceived barriers in an open-ended format. The three major barriers to exercise were time constraints, unsuitable weather, and lack of interest or desire.

In contrast, few efforts have been made to measure perceived barriers of persons with disabilities until recently. Rimmer, Rubin, and Braddock (2000) studied the barriers of a small sample of African American women with physical disabilities and found four barriers: cost of the exercise program, lack of energy, transportation, and lack of knowledge. Zhu and his colleagues (Doyle, Zhu, & Hedrick, 2001; Frogley, Zhu, Rimmer, & Creviston, 2001; Marquez, McAuley, & Zhu, 2001; Washburn & Zhu, 2001; Zhu, 2001) developed a barrier instrument to measure the barriers of persons with physical disabilities. A large sample of 411 adults was used for the study, and the three most severe barriers identified were lack of self-discipline, lack of time, and lack of motivation. Very recently, Rimmer, Riley, Wang, Rauworth, and Jurkowski (2004) conducted a focus-group study, and, on the basis of the barriers reported, they classified the barriers into 10 different categories (e.g., environment, economic issues, etc.). Little, however, is known about exercise and physical activity barriers of youth with disabilities on the basis of a comprehensive literature search.

Most barrier instruments currently in use were constructed and validated by traditional approaches that are based on classical test theory, which suffers from some psychometric disadvantages. Three of the psychometric problems are sample and item dependence, different scales for items and people, and improper use of ordinal Likert scale data. First, the calibrations of the measures are often sample and item dependent. Sample dependence means that the characteristic of a barrier item is determined by the sample the study uses, which is significant considering that different populations have inherently different ability levels to overcome certain barriers. Item dependence means that the characteristic of participants is determined by the items included. These make it hard to explain research findings across studies.

Traditionally, barrier items (i.e., item parameters) and participants (i.e., ability parameters) are placed and evaluated on different scales. This makes it difficult to compare and interpret test results from multiple studies. Finally, often the items measured with a Likert scale are incorrectly assumed to be interval data, and item responses can be summed to get a total score, which leads to incorrect interpretations. Likert scale scores are ordinal, thus not additive, because the distance between a score of 5 and 4 may differ from the distance between a score of 2 and 1.

Rasch modeling, or scaling (Rasch, 1960, 1980), addresses these limitations or problems of the traditional approaches using many different models. Rasch modeling is an advanced measurement theory widely used in both psychological and educational measurement practices. In Rasch modeling, item and person parameter estimates are calibrated independently of one another, which gives the estimated invariance between multiple (i.e., different ability level) groups. Parameter invariance can control the limitation of

sample and item dependence and makes it possible to generalize calibrations from one data set to another (Zhu, 1996; Zhu & Cole, 1996; Zhu et al., 2001). The use of the Rasch model also places the items and persons on a common logit metric, which allows for the examination of the relative positions of items and persons. Responses based on the ordinal scales are transformed into interval scales in which proper parametric statistics can be applied. All of these advantages help to interpret the results in a meaningful and useful way. The Rasch calibration is an informative and practical method to assess exercise and physical activity barriers. Thus, the purpose of this study was to investigate exercise and physical activity barriers of active youth with physical disabilities using Rasch modeling.

Method

Barrier Instrument

The 46-item exercise barrier instrument, developed by Zhu (2001), was adopted for this study. The participants were asked to report how often the barrier prevented them from doing exercise at a moderate level, such as recreational swimming, gardening, and heavy house cleaning. The participants rated the barrier on a Likert scale ranging from 1 (*never*) to 3 (*very often*), for the degree to which the barrier has inhibited their participation in physical activity.¹

Participants

The barrier instrument was administered to 145 youth with physical disabilities (117 boys and 28 girls, ranging in age from 12 to 19 years). The participants were recruited from a wheelchair basketball summer camp at a midwestern university. Data collection consisted of two major parts: parental consent and participant involvement. First, the parents of the participants received informed consent forms, which were read, signed, and returned by mail prior to the start of the wheelchair basketball camp. Once parental consent was obtained, we collected the data during the wheelchair basketball camp. Data were obtained from two separate camps over a 2-week period during the summer. The participants were asked to provide the information after a short presentation on how to fill out the form. The survey was explained in detail to the participants, and any questions were answered by the primary author.

Data Analyses

The Rasch measurement computer program FACETS (Linacre, 2002a) was used to examine exercise barriers for youth with physical disabilities. Two facets, exercise barrier severity and perseverance, were evaluated in the analysis, and the Rasch rating scale model was defined as follows:

$$\ln[P_{nj}/1 - P_{nj(k-1)}] = D_n - C_j - F_k,$$

where P_{nj} is the probability of barrier item n being rated k category

¹ The instrument and scoring table are available on request from Minsoo Kang.

by respondent j , $P_{nj(k-1)}$ is the probability of barrier item n being rated $k-1$ category by respondent j , D_n is the severity of barrier item n , C_j is the perseverance of respondent j , and F_k is the threshold between category step k and category step $k-1$ of a scale.

The model-data fit was evaluated, followed by item parameters (barrier severity). The higher the logit score for an item, the more severe or difficult it is for the participants, indicating that most participants with logit scores below it will have difficulty with the barrier. Detailed information concerning each barrier item, item difficulty (severity), and standard error (local precision) was examined. Next, the ability parameters (exercise perseverance) of the participants were examined. The higher the logit score, the greater the ability to persevere. For example, if the exercise perseverance score is higher than the item severity (logits), then the probability that the person will be able to persevere over that barrier is greater. Group descriptive statistics were also computed by age, gender, and wheelchair basketball classification levels on the exercise perseverance score.

The objective of the National Wheelchair Basketball Association (NWBA) classification is the equalization of competition among teams, particularly in the form of a team-balance rule that requires teams to play a certain number of classes at one time. NWBA classification has three classes. The most limited classification is Class I, which is defined as complete motor loss at thoracic T7 or above, or comparable disability where there is total loss of muscle function originating at or above T7. Class II is complete motor loss originating at T8 and descending through and including lumbar L2. Also included in this class are amputees with bilateral hip disarticulation. Class III is the least limited classification, and it demonstrates complete motor loss originating at L2 and all other physical disabilities as related to lower extremity paralysis or paresis originating at or below sacrum S1. All lower extremity amputees are included in this class (NWBA Official Rules and Case Book, 2001–2002).

Finally, to establish the evidence of convergent validity of the exercise barrier scale, we correlated exercise perseverance scores from participants (in logits) with general perceived physical activity level, relative activity level compared with peers, and knowledge and skill of exercising. The participants rated their general physical activity level (i.e., 1 = *not active at all* to 5 = *extremely active*), relative physical activity level compared with their peers (i.e., 1 = *not active at all* to 5 = *extremely active*), and knowledge and skill of exercising (i.e., 1 = *poor* to 5 = *excellent*) on a 5-point Likert scale.

Results

Model-Data Fit

Model-data fit was determined by item Infit and Outfit statistics. Infit represents the information-weighted mean-square residual between observed and expected responses, and Outfit is similar to Infit statistics but is more sensitive to outliers. The expected Infit and Outfit value is 1.0, which indicates that a model fits the data well. Linacre (2002b) and Lunz, Wright, and Linacre (1990) proposed a criterion for deciding acceptable and unacceptable fit in which any value (Infit or Outfit) less than 0.5 and greater than 1.5 is considered a misfit. Values greater than 1.5 indicate inconsistent response, and values less than 0.5 show too little variation.

Overall, the model fit the data well. Except for one item, all the

Infit and Outfit statistics were close to 1.0. One item had fit statistics out of the acceptable range (i.e., ≤ 0.5 or ≥ 1.5) and was eliminated from the final estimations: "Super Crip" syndrome (too high an expectation from others; Infit = 1.5 and Outfit = 1.8). This finding provided evidence for the embedded assumption of a unidimensional structure in the Rasch model.

Barrier Severity Estimates

The item parameters of exercise barrier severity and the ability parameters of examinees' exercise perseverance were calibrated and placed on a common logit metric, which allowed the examination of the relative positions of items and examinees. A higher logit indicated a more difficult barrier. Item difficulties (barrier severity) ranged from -1.53 to 1.43 logits. The item separation index was 3.63, which indicated that the exercise barrier items were well spread out along the measurement scale. The separation reliability was .93, which indicated a high degree of confidence in replicating placement within measurement error for another sample (Fisher, 1992; Wright & Masters, 2002).

The five most difficult barriers that youth with disabilities faced were lack of time (logit = 1.43), pain or discomfort (logit = 0.95), lack of a place to exercise with peers (logit = 0.87), weather (logit = 0.67), and people's misconception of the respondent's physical condition or ability (logit = 0.61). The five least difficult barriers were fear of getting hurt in transportation (logit = -1.53), followed by lack of family support (logit = -1.37), fear of safety (logit = -1.25), inconvenience of perspiration or combing (logit = -1.18), and fear of injury (logit = -0.88). The barrier item estimations in order of severity are reported in Table 1.

Exercise Perseverance Estimates

Higher exercise perseverance indicates better ability to overcome exercise barriers. Examinees' exercise perseverance ranged from -0.99 (less perseverance) to 5.15 (more perseverance) logits, with a mean of 1.75 and standard deviation of 1.17. The examinee separation index and separation reliability statistics were 3.20 and .91, respectively. These indicated that the examinees are well spread out along the measurement scale with a high degree of confidence (separation reliability = .91) in replicating placement within measurement error (Wright & Masters, 2002).

Group descriptive statistics by age, gender, and NWBA classification levels were also calculated. No statistical significance test was performed because of the unbalance in sample size. The participants were categorized into three groups by age: 13 years old and younger, from 14 years through 17 years, and 18 years and older. The older youths demonstrated higher exercise perseverance ($M \pm SD = 2.12 \pm 1.29$) than the younger children ($M \pm SD = 1.32 \pm 0.93$). The mean exercise perseverance for boys and girls was comparable. There was no obvious difference among the three classification levels; Class I had slightly higher means than Class II and Class III. Exercise perseverance scores by age, gender, and NWBA classification levels are summarized in Table 2.

Evidence of Convergent Validity

High exercise perseverance should be associated with a person having a high level of general perceived physical activity and

Table 1
Summary of Barrier Item Calibration (45 Fit Items)

Item	Calibration (logit)	SE (logit)	Infit (mean-square residual)	Outfit (mean-square residual)
Lack of time	1.43	0.14	0.9	1.0
Pain	0.95	0.15	0.9	0.9
Lack of a place to exercise with peers	0.87	0.15	1.5	1.4
Weather	0.67	0.15	0.8	0.9
People's misconception	0.61	0.15	1.3	1.3
Lack of transportation	0.59	0.15	1.0	1.0
Lack of adapted equipment	0.58	0.15	1.0	1.1
Lack of self-discipline	0.58	0.15	1.1	1.4
Lack of company	0.58	0.15	1.0	1.0
Physical condition	0.57	0.15	1.0	1.2
Lack of equipment	0.54	0.15	0.9	0.9
Accessibility of facilities	0.52	0.15	0.9	0.9
Lack of block of time	0.48	0.15	0.9	0.8
No space to exercise	0.46	0.15	0.9	0.8
When it is too cold or hot	0.45	0.15	0.9	1.0
Lack of trained staff	0.32	0.16	0.9	0.9
Available act not interesting	0.31	0.16	1.1	1.0
Not knowing kind of exercise	0.27	0.16	1.1	1.0
Lack of skills	0.26	0.16	0.9	0.9
Lack of interest	0.22	0.16	0.9	0.9
Lack of motivation	0.20	0.16	1.0	0.9
Lack of enjoyment	0.10	0.16	1.1	0.9
Where to exercise	0.04	0.16	1.1	1.0
Lack of volunteer	0.00	0.16	0.8	0.7
Lack of awareness	-0.01	0.16	0.9	0.8
How to use equipment	-0.04	0.16	0.9	1.0
Showering and changing facility	-0.05	0.17	1.5	1.3
Lack of LTE program	-0.12	0.17	1.1	0.9
Lack of transition	-0.19	0.17	1.1	1.0
Poor health	-0.24	0.17	1.1	1.2
People's unfriendly attitude	-0.32	0.17	0.9	0.8
Inconvenient to prepare	-0.35	0.17	0.9	0.8
Time taken to shower/change	-0.36	0.17	1.2	1.2
Not knowing how to exercise	-0.37	0.18	0.9	0.8
Cost of exercising	-0.38	0.17	1.0	0.9
Self-conscious/embarrassed	-0.46	0.18	1.2	1.2
Fear of incontinence	-0.49	0.18	1.0	1.0
Discouragement	-0.54	0.18	1.0	0.8
Unpleasant experience in past	-0.69	0.19	0.8	0.6
Exercise intensity is too high	-0.80	0.19	1.1	1.2
Fear of injury	-0.88	0.20	1.0	0.9
Inconvenience of sweat/combing	-1.18	0.21	1.0	1.0
Fear of safety	-1.25	0.22	0.9	1.5
Lack of family support	-1.37	0.22	1.1	0.9
Fear of getting hurt in transportation	-1.53	0.23	1.4	1.5

Note. Item names are descriptions of the content and do not reflect the exact wording of the question. LTE = learn to exercise.

relative activity level compared with peers, as well as increased knowledge and skill of exercising. Exercise perseverance scores were positively correlated with a rating of their general level of physical activity ($r = .38$), their relative physical activity compared with peers ($r = .34$), and knowledge and skill of exercising ($r = .25$), which supported evidence of convergent validity of the exercise barrier scale.

Discussion

Disability affects millions of Americans and has a tremendous impact on the current health care system. Understanding the bar-

riers of persons with disability is essential for designing effective interventions to promote physical activity for this population. In this study, we made an initial attempt to investigate exercise and physical activity barriers of youth with physical disabilities with a 46-item exercise barrier instrument.

After calibrating barrier items and persons on the same scale, the barrier instrument represented the population of youth with physical disabilities very well. There was only one misfitting item. The item dealt with "Super Crip" syndrome, which refers to others having too high an expectation of someone with a disability. It seems that children had difficulty understanding its meaning. As a result, this item was eliminated from the final instrument calibration.

Table 2
Summary of Exercise Perseverance by Group

Group	<i>n</i>	Exercise perseverance (in logits)	
		<i>M</i>	<i>SD</i>
Age			
13 years old and younger	13	1.32	0.93
14 through 17 years	67	1.55	1.03
18 years and older	61	2.12	1.29
Gender			
Boys	117	1.72	1.14
Girls	28	1.88	1.28
NWBA classification			
Class I	24	1.96	1.25
Class II	53	1.77	1.13
Class III	57	1.74	1.22

Note. National Wheelchair Basketball Association (NWBA) has three classes: Class I = complete motor loss at thoracic T7 or above or comparable disability where there is total loss of muscle function originating at or above T7; Class II = complete motor loss originating at T8 and descending through and including lumbar L2, including amputees with bilateral hip disarticulation; Class III = complete motor loss originating at L2 and all other physical disabilities as related to lower extremity paralysis or paresis originating at or below sacrum S1, including all lower extremity amputees.

The five most severe and easiest barriers identified in this study were compared with those of adults with physical disabilities (Zhu, 2001). The five most severe barriers of adults with physical disability were lack of self-discipline, lack of time, lack of motivation, physical condition due to disability, and lack of a block of time. The five most difficult barriers of youth with physical disabilities were lack of time, pain or discomfort, lack of a place to exercise with peers, weather, and people's misconception of the person's physical condition or ability. On the basis of the most difficult barriers, it appears that the adults tend toward more psychological explanations that include an internal locus of control, whereas the youths' barriers were more varied. This difference in the most severe barriers could possibly be due to the sample of youth in this study. All the youth were active and thought to demonstrate a higher level of exercise perseverance than normal for the general population of children with disabilities. This high level of exercise perseverance could explain the differences in psychological barriers.

Lack of time is a common major barrier that keeps youth and adults with physical disabilities from participating in exercise and physical activity. This barrier has been identified in many groups of people, including women (Johnson et al., 1990; Zhu et al., 2001), adults (Stutts, 2002), and high school populations (Tappe et al., 1989). Not having enough time to exercise is among the most frequently cited reasons to avoid starting or maintaining an exercise program (Lox, Martin, & Petruzello, 2003). Lox, Martin, & Petruzello reported that "people who cited lack of time as a barrier to physical activity actually performed more hours of physical activity per week than did those who did not consider lack of time to be a barrier" (p. 90). The authors concluded that people who engage in regular exercise employ superior time management strategies compared with nonexercisers, and they make exercise a priority in their schedule.

When developing strategies for addressing the lack of time to

exercise, all potential reasons and not just time management skills should be examined. The real-life reasons why lack of time is a common barrier to exercise for many people regardless of their health condition are numerous. Depending on the group, reasons for a lack of time can include time spent commuting to and from work, lack of access to appropriate or adequate recreational facilities, convenience (and affordability) of these facilities, family demands (including demands faced by dual-career couples and families that have time demands from dependent members), and lack of knowledge about alternative exercises that could be conducted without facilities or in the home.

Strategies to overcome the lack of time barrier, therefore, might include scheduling physical activity into one's daily routine, exercising at the same time each day, planning ahead for potential problems to having time to exercise and preplanning ways to overcome them, and perceiving exercise as a necessity—a priority—in one's life to virtually ensure that exercise becomes a regular habit.

The five least severe barriers of adults with physical disability were fear of getting hurt in transportation, "Super Crip" syndrome, inconvenience of perspiration or combing, people's unfriendly attitude, and fear of incontinence or similar conditions. The five least difficult barriers from this study were fear of getting hurt in transportation, followed by lack of family support, fear of safety, inconvenience of perspiration or combing, and fear of injury. Fear of getting hurt in transportation and inconvenience of perspiration or combing were not considered difficult barriers to overcome by the two populations.

The perceptions of barriers to exercise of children with and without disabilities were similar. Lack of time and unsuitable weather as severe barriers to exercise for youth with physical disability were also identified as major barriers to exercise for youth without physical disability (Tappe et al., 1989). Tappe et al. (1989) identified major perceived barriers to exercise among youth: time constraints, unsuitable weather, school and schoolwork, and lack of interest or desire. This finding indicates the need for youth both with and without physical disability to learn and effectively use time management strategies and to have a backup plan for being active, such as exercising in enclosed air-conditioned or heated areas in case the weather fails to cooperate.

The person's ability parameters of exercise perseverance were estimated during the calibration process. Age and gender scores were fairly similar and consistent with the findings of other researchers, but the comparisons of the NWBA classification levels were a bit surprising. As expected, the age of the participants appears to influence their exercise perseverance. The older youth demonstrated greater perseverance, which was probably due to their decreased reliance on parents. The exercise perseverance scores for the three NWBA classification levels were similar, which was surprising. We expected that Class I individuals, who are the most limited, would have lower perseverance than Class III individuals. This finding might be explained by a sample with high exercise perseverance in nature. Thus, even though the finding showed that the degree of physical disability does not relate to exercise perseverance, the interpretation of the finding should be made cautiously.

It should be acknowledged that there are a few limitations in this study. The characteristic of the sample is one of them. The participants in this study were all currently participating in a wheel-

chair basketball camp, which requires a great deal of physical activity. This subpopulation of youth most likely does not truly reflect the population of youth with physical disability because of their already high exercise perseverance levels. It is worth noting that the level of disability in this sample had a wide range, from lower leg amputee and mild cerebral palsy to severe spina bifida. Another limitation was the small sample size. Rasch calibrations are data hungry and typically require a sample size at least 200. Unfortunately, there is not a large population of youth with physical disabilities centrally located, so the sample size of 145 in the study was considered relatively large for this population.

A rather new approach in barrier research has been placing the emphasis on the positive aspect of the trait (exercise perseverance) rather than the negative (exercise barriers). Reporting the positive trait of the individual—exercise perseverance—makes more sense in the practical use of trying to increase the number of individuals participating in exercise and physical activity. Zhu et al. (2001) recognized the potential benefits of using both the positive (exercise perseverance) and the negative (perceived barriers) in exercise and physical activity interventions. The concept of exercise perseverance is a relatively new term. Exercise perseverance is a person's ability to overcome barriers that inhibit their participation in exercise and physical activity (Zhu et al., 2001). Much of the literature has focused on measuring the negative characteristic—barriers to exercises (Johnson et al., 1990; Tappe et al., 1989). Zhu et al. suggested focusing on measuring exercise perseverance as a way to describe both exercise barriers (stimulus) and exercise perseverance (attribute) for better understanding of the barrier assessment. The nature of a barrier assessment is the same as cognitive or psychological testing so that both a stimulus and an attribute are involved. The practical implication of this method of focusing on the positive attribute is that participants find it easier to understand. Strategies then can be developed to assist people in overcoming exercise barriers to improve their exercise perseverance.

Overall, exercise barriers of youth with physical disabilities are similar to those of adults with physical disabilities; however, there were some unique barriers for both youth and adults with physical disabilities. Knowing the barriers' difficulty level can help in identifying specific barriers to target so that increases in physical activity participation and exercise perseverance can be improved. Removing major exercise barriers such as lack of time should be a part of any future exercise and physical activity research interventions targeting this population.

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