

## RESEARCH PAPER

# The effect of adaptive sports on employment among people with disabilities

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### Abstract

**Purpose:** The purpose of this study is to analyse the role of adaptive sport in predicting employment for individuals with physical disabilities. **Method:** This study is cross-sectional. We collected survey data on employment and other covariates including education, age, age at disability onset, veteran status and athletic classification from 140 mobility impaired athletes who play either wheelchair rugby or wheelchair basketball. **Results:** One hundred and thirty-one participants were studied. Our analysis shows that playing an additional year of adaptive sport is associated with an approximately 4% increase in likelihood of employment. Education and duration of disability are found to be positive predictors of employment, while veteran status and severity of injury are negative predictors of employment. Age of disability onset is not found to be a predictor of employment when other controls are included. **Conclusions:** This result indicates that a substantial economic benefit would result from increased participation in adaptive sport, and therefore may justify additional funding to expand adaptive sport programs.

### Keywords

Adaptive sport, disability employment, disability labor force participation, disability labor supply, disability studies, mobility impairment, physical disability

### History

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### ► Implications for Rehabilitation

- Employment rates are very low among individuals with physical disabilities, despite research indicating extensive benefits from employment.
- Participation in adaptive sport is associated with a higher likelihood of employment.
- Efforts to increase participation in adaptive sport could have a large economic benefit.

### Background

Historically, people with disabilities have been a socially and economically disadvantaged segment of society. Researchers Page et al. [1] even coined the term “Disability Ghetto” to describe this marginalization, manifested in discrimination and socio-cultural limitations, and further perpetuated by a lower rate of employment among individuals with disabilities. While employment on its own has its obvious advantages, financial and otherwise, interestingly, separate studies have found that both adaptive sport [2] and employment [3] have provided large quality of life benefits to people with disabilities. Though sport and employment may seem unrelated, similar resulting benefits to well-being, whether they be physical, emotional, personal or financial, provoke the thought of correlation. Thus, the purpose of this study is to investigate a possible link between participation in adaptive sport and the likelihood of being employed.

Adaptive sports are conventional sports, such as basketball, that have been modified to meet the needs of people with disabilities. We hypothesize that participation in adaptive sport is associated with an increased rate of employment and therefore provides wide-ranging economic benefits. Athletes with disabilities may develop certain skills or traits that may lead to increased opportunities in the workforce. Upon employment, individuals benefit directly from their increased earnings, and also from an increased sense of independence, self-esteem and social grounding. Moreover, society as a whole also benefits from those individuals’ reduced reliance on government programs. This research can help governments to make best decisions on adaptive programs that can lead to more effective and positive impacts on the economies of individuals with disabilities and the communities in which they live.

Although, adaptive sports for physical, mental and communicative disabilities exist, we will look specifically at wheelchair sports that are designed for those with physical disabilities. A sample set of adaptive basketball and adaptive rugby players with varying levels of physiological function will be surveyed to gather data on their classification of impairment, employment status and level of participation in sport, among other factors.

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Then, a multivariate logistic regression analysis will be conducted for variables predicting employment. Data will be analysed and resulting implications will be discussed to determine the validity of the hypothesis and possible connection between adaptive sport and prospects of employment. To begin, however, the following literature review will cover what is currently known about effects of employment for people with disabilities, the realities of disability and employment rates, the impact of sports on employment in the general population and finally the impact of sports on the disabled population. All these topics will be considered with the data and results in the final evaluation of the impact of sports on employment of persons with disabilities.

## Literature review

### Positive effects of employment for people with disabilities

Employment can provide many benefits. In addition to the financial benefit, employed individuals can also gain opportunities for social interaction and an increased sense of purpose. These benefits may be especially important for people with disabilities due to their history of social exclusion [4,5]. However, to study employment among people with disabilities it is important to first define disability.

According to the World Health Organization's International Classification of Functioning, Disability and Health [6], disability is viewed as a continuum along which everyone functions at a different level. In practice however, data collection efforts typically place individuals into distinct categories for the purposes of gathering disability statistics. For example, the Survey of Income and Program Participation (SIPP) defines three disability domains: communicative, mental and physical. Employment among people with disabilities is much lower than those without a disability, and there is substantial variation within these three disability categories. Data from the 2008 SIPP shows that only 28.7% of people with a physical disability are employed, versus 72.8% of the overall population. This figure drops to 18.3% for those who use a wheelchair [7].

Using SIPP data and data from other national household surveys, Schur [5] shows that employment does indeed have larger positive effects among people with disabilities than those without. She finds that employment raises household income by 49% for individuals with a disability versus 13% for those without a disability. Employment also raises the probability of meeting regularly with a group of people by 10% for people with disabilities. This reduction in social isolation was not present among individuals without a disability.

Disabilities in the physical domain constitute a huge range of mobility impairments; therefore much of the research linking employment and physical disability focuses on either retirement decisions among the elderly [8] or specific conditions, such as multiple sclerosis [9]. There is a substantial body of literature investigating employment among individuals with SCI [10–13]. This may be in part because individuals with spinal cord injuries (SCI) make up a very large and well-defined group of wheelchair users in the US, and also because this condition is stable (i.e. non-degenerative).

A much smaller body of literature examines employment among populations of people with mobility impairments that are not limited to one disease or illness. Kemp and Krause [14] study employment and other quality of life outcomes for both SCI patients and individuals with post-polio syndrome. Other examples include Ville and Winance [15], who perform a qualitative study of employment trajectories among a wide cross-section of wheelchair users, and Mitchell et al. [16], who

conduct a quantitative study of employment among individuals with several different physical impairments.

Among the SCI population, there is strong evidence that employment has significant psychological benefits. Westgren and Levi [11] find that individuals with SCI who were not employed full-time scored significantly lower on a quality of life survey than a control group without SCI. However, individuals with SCI who were employed full-time did not have significantly lower quality of life scores than the control group. Krause [3] asked SCI several questions about life satisfaction, and found that individuals who were currently employed rated almost all aspects of their lives more positively than those who were not employed.

### Current research on disability and employment rate

Given the low level of employment among people with disabilities, supporting policies that can improve employment rates for people with disabilities is an important goal. In the United States, the Americans with Disabilities Act (ADA) is the most important disability legislation in recent history. The passage of the ADA in 1990 sparked a wave of research attempting to quantify its effects on employment and wages among people with disabilities.

Empirically, it seems that the overall employment and wage effects of the ADA have been small. Acemoglu and Angrist [17] found a negative effect on employment and no effect on wages during 1993, which was the first full year that the ADA was in effect. Further research has highlighted the sensitivity of the employment rate among the disabled to the definition of disability that is used, showing that the change in employment level among people with disabilities can be either positive or negative with different definitions of disability [18]. DeLeire [19] measured the amount of wage discrimination for people with disabilities and found that it did not change when comparing data from before and after the passage of the ADA – 1984 and 1993, respectively.

In addition to legislation, such as the ADA, that should affect the amount of labor demanded by employers, there are many other individual-level factors that can affect the probability that a person with a disability is employed. Within the population of individuals with SCI, there is detailed research on the various factors that affect employment. These factors include standard demographic variables, such as education, race, ethnicity and gender, as well as issues specific to individuals with SCI, such as the age of disability onset and severity of injury.

A meta-analysis by Ottomanelli and Lind [20] finds that education is one of the most important predictors of employment for individuals with SCI, with more education being strongly associated with a higher rate of employment. Other demographic factors that are predictive of employment include race, ethnicity and gender. These factors play a similar role in employment among the SCI population and the general population. Krause et al. [12] find that Caucasians are more likely to be employed than African Americans or Hispanics. He also finds that although employment rates among men and women do not significantly differ, women are more likely to work only part-time. Another study by Krause and Broderick [21] looks at various dimensions of subjective well-being as a function of gender, race and ethnicity, including feelings about employment opportunities. He finds that employment opportunity wellbeing scores are not significantly different between men and women. However, the perception of employment opportunities does differ among racial and ethnic groups, with Caucasians having the highest satisfaction level.

In addition to these demographic factors, there are several employment predictors that are specific to individuals with SCI. These factors include the severity of the injury, the age at which

the injury occurred and how much time has passed since the onset of the injury. For individuals with an SCI, chronological age can be broken into the age of disability onset and the duration of time lived post-injury. Krause et al. [12] find that the age of disability onset is negatively correlated with the likelihood of employment, i.e. those injured at a younger age are more likely to be employed. Kannisto et al. [22] find that people injured in adulthood have lower employment rates than those injured in childhood. Years lived post-injury have been found to be positively correlated with employment [12]. Data from the National Spinal Cord Injury Statistical Center (NSCISC) show that the employment rate for individuals with SCI increases quickly from 11.8% to 27.5% over the first 10 years, and then slowly increases to 34.5% by year 20 [23].

While no study has examined the employment effect of participation in adaptive sports specifically, links have been established between physical activity and employment.

Both Manns and Chad [24] and Noreau and Shephard [25] found a positive relationship between physical activity and employment rate among the SCI population. These studies, combined with research showing the positive employment effects stemming from participation in traditional sports, give reason to believe that participation in adaptive sport could improve employment rates for people with disabilities.

### Impact of sports on employment for general population

Previous studies have found a positive relationship between athletic participation and labor market outcomes for the able-bodied population, and suggest many potential mechanisms whereby athletics lead to higher educational attainment, employment and/or wages. Barron et al. [26] find that participation in high school sports among males is correlated with both higher levels of education and higher wages later in life. They hypothesize that athletic participation drives this improvement in labor market outcomes partly because it acts as an extracurricular form of training in which students learn several skills including self-discipline, teamwork and decision-making in high pressure situations.

Stevenson [27] finds similar results for females who play high school sports. In 1972, Congress enacted Title IX of the Educational Amendments to the 1964 Civil Rights Act. Title IX mandates that educational institutions should provide equal opportunities to men and women in all areas, including athletics. This Act resulted in a rapid and drastic increase in female athletic participation at the high school level. Stevenson [27] uses this change stemming from the passage of Title IX as a natural experiment to isolate the effects of female athletic participation. Her results indicate that a 10% increase in female sports participation results in an increase in educational attainment of 0.03–0.05 years, and a 1.5% increase in employment.

For those involved in playing recreational sports in adulthood, Lechner [28] also reports a positive relationship between athletics and employment and between athletics and health outcomes. He discusses three mechanisms for sports to affect employment. First, increased physical fitness levels could directly translate to increased productivity for those individuals. Second, sports provide social networking opportunities, especially for those with smaller social networks, such as recent immigrants. Third, athletic participation may signal to employers that the individual is motivated and in good health, making them more appealing and competitive candidates in the job market. Using a panel data set from Germany to look at long-run effects of sports participation during adulthood, Lechner [28] finds significant positive effects on earnings for both men and women, and a significant increase in the likelihood of being employed full-time for women.

### Impact of sports on disabled population

Adaptive sport is more global than it has ever been [29]. Perhaps because of this, the research on adaptive sport is increasing and varying. To date, the research in adaptive sport can broadly be categorized into three lines. The first of these focuses on athlete performance. This category may include studies of physiological or psychological performance of the athletes compared to their non-disabled counterparts, or it may focus on the disability independently. Examples of research regarding athlete performance include Hindawi et al. [30], Vinet et al. [31] and Mason et al. [32]. The second line addresses spectatorship and support of adaptive sport; this research focuses on the viewership of sport and its organizational structure (e.g. [33–36]). The third and most pertinent line to our research focuses on the impact of adaptive sport on the participants.

According to DePauw and Gavron [2], sport can benefit almost every aspect of the life of a person with a disability. The benefits include but are not limited to increased self-esteem [37], strength and endurance [38], social integration [39], physical independence [40] and life satisfaction [41]. In fact, the advantages of sport participation are so varied and impactful that these findings, along with overwhelming anecdotal evidence, assisted in the professional development of the field of therapeutic recreation [42].

Participation rates among the mobility impaired population seem to be quite low as indicated by the size of adaptive sport programs. Even in developed nations, barriers to playing adaptive sport can be daunting. Adaptive sport participation is limited by obstacles, such as a lack of accessibility in sport facilities, dislike of sports commonly associated with disability, physical dependence making practice difficult and limited time and money [13]. While Tasiemski et al. [13] uses a survey instrument to measure athletic identity and identify several barriers to playing adaptive sport, he also acknowledges that there could be psychological barriers, such as reduced self-esteem, that are not captured in his work. Qualitative research, such as the narrative inquiry method used by Smith and Sparkes [43], is an important tool for understanding these psychological barriers.

Smith and Sparkes [43,44] found through qualitative inquiry that life in a wheelchair can be disappointing and hopes for a cure may be a focus for a number of individuals who have not come to terms with their disabilities. These frustrations, depression, and chaos, as Smith and Sparkes note, can be highly limiting and overwhelming. Many but not all of the hopes identified by these studies focused on walking again, but some participants accepted their disabilities and found comfort in their new lives. Perhaps one of the most appropriate mechanisms to assist people in accepting and engaging in a life with a disability is sport.

Clearly some of the barriers associated with playing adaptive sport, such as the lack of accessible facilities and monetary constraints, could be mitigated through increased financial support for adaptive sport. Unfortunately, despite the extensive benefits that sport provides for people with disabilities, resources to support disability sport are lacking, especially when compared to other developed nations [45] and for those of college age [46]. This underdevelopment may be due in part to the lack of perceived economic return on investing in these programs.

As noted previously, employment among those with SCI is quite low [20]. Establishing a clear relationship between adaptive sport and employment would provide opportunities to increase resources for adaptive sport and improve the quality of the lives of many with SCI.

## Methods

### Data collection

We collected survey data at a wheelchair basketball tournament in Las Vegas, NV in February 2014, and at the Wheelchair Rugby National Tournament in Louisville, KY in March 2014. These events included both competitive and recreational teams from various cities across the United States. All survey respondents are currently participating in either wheelchair basketball or wheelchair rugby. Wheelchair basketball players are typically paraplegic and wheelchair rugby players are typically quadriplegic. Therefore, collecting data from these two sports gives a wide range of levels of mobility impairment.

The questions in our survey instrument can be grouped into the following areas: pre-disability questions, current athletic participation, current outcomes and demographic questions. All questions are quantitative or categorical, with the exception of a question about the nature of the individual's disability which is open-ended. The pre-disability questions included questions about education, athletic participation and employment prior to disability onset. Due to a high prevalence of respondents whose disability began in childhood (32% of our sample) we did not use the pre-disability questions in our final analysis. Questions about current athletic participation included the number of years the respondent has been playing adaptive sport, the respondent's sports classification and the distance travelled to attend sports practice. Questions about current outcomes included categorical questions about current level of employment and educational attainment. Demographic questions included gender, race, ethnicity, age and veteran status.

Feedback on our survey was solicited from researchers and practitioners, but formal pilot data were not collected due to the infrequency and location of adaptive sport tournaments. During the first round of data collection a question about wages was asked, but was removed from the subsequent data collection due to a low response rate and concern that discomfort from answering this question could affect participants' willingness to complete the survey [47].

### Participants

We collected data from 140 individuals who are currently playing either wheelchair rugby or wheelchair basketball. We eliminated those age 62 and older, to focus on those who are in the traditional working age range. This exclusion reduced our sample size to 131.

Eighty-one percent of the respondents in our sample set have an SCI. The remainder of the population have mobility impairments stemming from polio, amputations, muscular dystrophy and a variety of other conditions. The prevalence of each of these conditions in our sample is detailed in Table 1.

The population was overwhelmingly male, with only 3% of respondents being female. It should be noted that the data

collection for wheelchair basketball took place at a men's tournament. While women are allowed to play on these teams, they generally play on women-only teams. Wheelchair rugby is a co-ed sport.

The racial breakdown was as follows: 79.3% Caucasian, 6.1% African American, 5.3% Asian, 2.3% Pacific Islander and 6.1% mixed race. For ethnicity, 6.1% of respondents reported being Latino. Ages ranged from 20 to 60 years with an average age of 36.2. As a point of reference, data from the NSCISC [23] show that 80.7% of people with SCI are male, and 67.4% are Caucasian. The age of disability onset ranged from 0 (for hereditary conditions) to 53, with an average of 19.5. The amount of time spent playing disability sports ranged from 3 months to 37 years, with an average of 10.0 years.

The most common education level was a bachelor's degree (29%), followed by some college (24.4%), associates degree or equivalent (18.3%), master's or doctorate or equivalent (10.7%), high school diploma (15.2%) and no high school (1.5%). The most common employment status was unemployed (34.3%), followed by full-time employed (29.8%), part-time employed (24.4%) and student (11.4%).

To control for the severity of the mobility impairment, we use the players' athletic classifications. In many adaptive sports, a numerical classification is given athletes to signify the athletes' functional ability, or conversely, their disability. In sports, such as track, wheelchair basketball, wheelchair rugby, table tennis and fencing, a lower number signifies a higher level of injury, or an athlete with less physiological function. Depending on the nature of the sport, the classification system either determines who will compete against each other (as in fencing and table tennis), or what combinations of players can be playing together at a given time (as in wheelchair rugby and wheelchair basketball). In the latter case, a team cannot play the most physiologically functional athletes at the same time but instead must provide a combination of players whose function scores, when combined, do not exceed a predetermined score (such as a 12 in wheelchair basketball or an eight in wheelchair rugby).

As parenthetically noted above, we examined athletes participating in wheelchair rugby and wheelchair basketball. All wheelchair rugby players must be classified as having both upper and lower extremity impairment. Rugby classification scores are in half-step increments from 0.5 to 3.5. Wheelchair basketball players can have both upper and lower extremity impairment, but due to the central nature of shooting the ball in the sport of basketball and also due to the more and more widespread availability of wheelchair rugby, few athletes with upper extremity impairment play wheelchair basketball. Wheelchair basketball classifications are 1, 2 and 3. Since wheelchair basketball players are typically less impaired than rugby players, we combined the two groups by adding three to the basketball classification. Therefore, we have a total of nine possible classifications, ranging from 0.5 to 6. The percentage of survey respondents with each possible classification is detailed in Table 2.

Table 1. Reasons for mobility impairment. Conditions affecting only one respondent are grouped under miscellaneous.

Nature of disability	% of sample
Spinal cord injury	80.9%
Amputee	3.8%
Muscular dystrophy	2.3%
Polio	2.3%
Spastic paraparesis	1.5%
Transverse myelitis	1.5%
Miscellaneous	4.6%
No answer	3.0%

Table 2. Percentage of survey respondents by sports classification.

Classification	% of sample	Sport
0.5	9.9%	Rugby
1	9.1%	
2	22.9%	
2.5	9.1%	
3	12.2%	
4	4.6%	Basketball
5	10.7%	
6	4.6%	

## Analysis

We define employment to be a 1 if the individual is employed either part or full-time, and 0 otherwise. In addition to the number of years the individual has participated in adaptive sports (*Sports Duration*) which is our variable of interest, we also control for five other factors that are likely to affect employment. We include two age-related variables – the number of years since the onset of disability (*Disability Duration*) and the age of disability onset (*Age of Onset*). Statistics from the NSCISC [23] show that the number of years since the onset of disability is highly correlated with employment status for those with SCI. The age of disability onset has been found highly significant in many studies, both of SCI patients [12] and a broader disabled population [48]. We also control for current education level (*Education*), which is measured in terms of educational milestones. Since veterans are eligible for more governmental assistance than non-veterans and at least one study [48] has found a negative correlation between veteran status and employment, we also control for veteran status (*Veteran*). Finally, we control for severity of impairment using the individual's wheelchair sport classification (*Classification*) as shown in Table 2.

To investigate the robustness of our regression results, we ran the same logistic regression on three different subgroups of our sample population. First, we eliminated females. This change did not significantly affect our results. Second, we eliminated wheelchair basketball players with a classification of 3. These are the least impaired individuals and they are often not full-time wheelchair users. In this sense they may be considered fundamentally different from the rest of the population. Again this change did not significantly impact our results. Finally, we eliminated all non-whites from our regression. This change lowered the magnitude of the coefficients on Sports Duration slightly, and also lowered the significance of those coefficients. This result may indicate that sports participation has less impact on employment for whites, but should be interpreted cautiously as the lower significance may be caused by either a weaker relationship between sports and employment or by a lack of statistical power due to the smaller sampling size.

## Results

The results of a multivariate logistic regression with employment as the outcome are shown in Table 3. A logistic regression of the effect of age of disability onset on employment is shown in Table 4.

## Discussion

In this study, we show that an additional year of participating in adaptive sports is associated with an increase in employment rate,

at least up through the first 10 years of playing sports. The association weakens when we include athletes who have been playing adaptive sports up to 15 years and disappears completely when including athletes who have played sports up to 20 years. This result may indicate that the employment benefits stemming from adaptive sports are fully realized within the first 10 years. Increasing chronological age may also eventually be counteracting the employment effects from playing adaptive sports.

As discussed earlier, employment provides individuals with financial benefits as well as substantial psychological and social benefits. If adaptive sports are causing an increase in employment, these benefits can be added to the long list of benefits from adaptive sport that have already been shown to exist, including improved physical fitness, self-esteem and socialization.

In addition to being the first study to look at the effect of participating in adaptive sports on employment, it is also one of the first quantitative studies of employment rates among individuals with physical disabilities that are not limited to a specific disease or impairment.

With the exception of duration of adaptive sport participation, the factors we analysed for predicting employment have been studied previously for the SCI population [20]. We found employment patterns among our population of wheelchair athletes that largely mirrored those of the more specific SCI population, indicating that there are few, if any, systematic differences between our population of athletes (80% of whom have a SCI) and the larger SCI population. Our results showed that the number of years since disability onset was positively associated with employment, and the severity of impairment was negatively associated with employment. Both of these results have been found repeatedly for the SCI population [12,49]. Interestingly, our data show that this negative relationship between injury severity and employment became less significant as we included individuals who had been playing sports longer. These results may indicate that over time, the positive fitness and health benefits of sport somewhat mitigate the disadvantage of having a more severe impairment. Unsurprisingly, our data confirmed the previous finding that having more education was associated with a higher likelihood of employment [20]. We also found that being a veteran was associated with having a lower likelihood of employment, mirroring results found by Pfeiffer [48].

Table 4. Logistic regression analysis of effect of age of onset on employment.

	<10 years		<15 years		<20 years	
	B	p Value	B	p Value	B	p Value
Age of onset	-0.057	0.025	-0.054	0.017	-0.058	0.008

Table 3. Logistic regression analysis for variables predicting employment.

	<10 yrs		<15 yrs		<20 yrs	
	B	p Value	B	p Value	B	p Value
Sports duration	0.235**	0.033	0.119	0.158	-0.010	0.854
Disability duration	0.172***	0.005	0.128**	0.012	0.096**	0.030
Age of onset	0.053	0.187	0.040	0.259	-0.001	0.984
Education	0.069	0.799	0.348	0.132	0.279	0.165
Veteran	-1.084	0.195	-1.318*	0.085	-0.963	0.131
Classification	0.455*	0.079	0.384*	0.090	0.267	0.140
# of Obs.	71		82		101	

\*Significant at 10%.

\*\*Significant at 5%.

\*\*\*Significant at 1%.

Unlike previous research [12] that has shown a clear negative relationship between age of disability onset and likelihood of employment, the age of onset is not significant in our results when combined with the other employment predictors. However, when age of onset is regressed individually on employment, a highly significant negative relationship is shown. Therefore, our findings do not contradict those from previous research but may indicate that other factors, such as participation in adaptive sport can weaken the link between age of onset and employment.

### Implications

Results from this study show a significant correlation between adaptive sport participation and employment, and provide a strong argument in favour of devoting more resources to the support and promotion of adaptive sports. As discussed earlier, there are numerous barriers to participation in disability sport, such as a lack of accessibility in sport facilities, dislike of sports commonly associated with disability, physical dependence making practice difficult and limited time and money [13]. The costs associated with adaptive sports include specialized wheelchairs and travel to compete against other teams. Athletes also incur at least some expenses out of pocket. Increased funding for adaptive sport programs could alleviate many of these barriers by defraying the costs associated with sports participation.

There is a large scope for improving the participation rates of adaptive sports. Census data [50] shows that over 25% of working age Americans participate in team sports. There is very little data regarding the participation rate of wheelchair users, but from the size of the adaptive sports programs and the size of the wheelchair population we can infer that it is much lower than the able-bodied participation rate. Increased participation in adaptive sport would provide benefits at the individual level as well as the societal level. To give a sense of the potential aggregate economic impact of expanding adaptive sports programs, if an additional 100 000 individuals (roughly 3% of the working age wheelchair population in the US) were to play adaptive sports for only one year, our model estimates that approximately 4000 of them would become employed. Given household income data from the SIPP [7] and results from Schur [5] indicating that employment raises the household income of a person with a disability by 49%, this new employment would add approximately \$40 million to the economy in the form of household income. This estimate does not include the additional economic benefit of a reduction in spending on government assistance to those newly employed individuals.

### Study limitations and future research

Time and scope were limiting factors in this study in that data were gathered only from individuals who were actively participating in two adaptive sports (wheelchair basketball and wheelchair rugby) at the time of the survey. Future studies should include a wider range of adaptive sports as well as a wider range of individuals with disabilities, including a control group of non-athletes to allow for matching techniques and further distinction of effects or benefits of participating in adaptive sport. Surveying a broader range of persons with disabilities may also yield interesting findings that address the incidental lack of diversity in our sample, consisting predominantly of white males. Succeeding research should investigate whether this invariability is unique to our sample or is common for the entire adaptive sports population. Gathering more data on non-white athletes would also allow for more analysis of potential interactions between race and other employment predictors including athletic participation. This would be a valuable contribution to the literature

investigating racial disparities in disability and health, and intersectionality between race, gender and disability [51,52].

Additionally, our study is cross-sectional nature, whereas a longitudinal study and/or retrospective panel could supplement this research by investigating whether participation in adaptive sports reduces the amount of time between disability onset and return to work, as well as the propensity to maintain employment once employed. A study of this nature could differentiate between short-term and long-term effects of playing sports and could include individuals who have played but are no longer active in adaptive sports. A longitudinal study could also be useful for identifying cohort effects that have resulted from the gradual changes in accessibility and societal attitudes in the two decades since the passage of the ADA.

Finally, regarding economic data, this study produces significant results that determine the impact on employment from playing an additional year of sports, yet we are unable to estimate the overall employment effect stemming from the decision to participate in adaptive sports. Without a 100% representative sample of people with disabilities, more accurate financial estimates cannot be inferred using existing data on employment rates among the study population.

Ideally, future research should eventually provide all of the necessary data to construct a cost–benefit analysis that could weigh the cost of additional funding for adaptive sports against the benefits of a potential employment increase. Although, we provide a basis for predicting the employment outcomes from an expansion of adaptive sports, we lack information and processes for translating adaptive sport funding to an increase in participation. A thorough cost–benefit analysis should include the direct benefits of increased employment as well as the cost savings from reduced government spending on programs such as disability insurance and Medicaid. It may even be possible to measure additional economic benefits resulting from greater time and opportunities that caregivers (or family members/friends) will inevitably have as a direct outcome of the independence earned by the newly-employed persons with disabilities.

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### Declaration of interest

The authors report no declarations of interest. The data collection effort was funded in part by Adaptive Athletics at the University of Houston.

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