



Research article

Parental physical activity support for parents of children with disabilities in Saudi Arabia

Majed M. Alhumaid

Department of Physical Education, College of Education, King Faisal University, Al-Ahsa 31982, Saudi Arabia

ARTICLE INFO

Keywords:

Physical activity
Exercise
Parental support
Children with disabilities
Disability

ABSTRACT

Physical activity (PA) is crucial for promoting physical, cognitive, and psychosocial health. Unfortunately, children with disabilities spend less time engaging in PA compared to their typically developing peers. Parents play a crucial role in supporting children with disabilities to increase their level of PA. However, there is scant research on the factors linked to parental support for PA among non-Western parents of children with disabilities, particularly in the context of Saudi Arabia. Therefore, to address this gap in the literature, the current study aimed to (i) measure parental support for encouraging PA in children with disabilities in Saudi Arabia, and (ii) examine the demographic factors associated with such support (e.g., family income, age of the child, type of disability, and parents' educational background). The sample included Saudi Arabian parents of children with disabilities ($N = 239$; fathers: $n = 123$; mothers: $n = 116$) who completed the Arabic version of the Parental Physical Activity Support Questionnaire for Parents of Children with Disabilities (PPSQ for PCD). The findings revealed that parental support for children with disabilities to engage in PA typically occurs less than once a week, indicating an inadequate level of support. A generalized linear model analysis demonstrated that several independent demographic variables are associated with overall parental support for PA among children with disabilities: participant age, educational background, parental engagement in PA, age of the child with a disability, disability status, club participation, knowledge of legislation or policies related to the rights of children with disabilities, and number of children in the family. The findings emphasize the significance of raising awareness among parents of children with disabilities to support their children in participating in PA, as well as addressing the barriers that hinder such support.

1. Introduction

Physical activity (PA) is crucial for physical, cognitive, and psychosocial health in children and adolescents with both typical and atypical development [1–3]. However, even with many efforts in place to promote PA among this cohort, a significant number fail to meet established PA guidelines [4–6]. PA encompasses a diverse array of activities.

It can be defined as ‘all forms of movement, whether undertaken voluntarily (exercise and sport), unavoidably (occupational and domestic chores) or deliberately (adoption of an active lifestyle)’ [7] (p.2). PA is involved in various sports that are practiced both informally and formally, such as running, cycling, and participating in sports clubs [8]. Engaging in PA of any form is recognized as a preventative measure against chronic diseases. Long-term observational studies highlight that maintaining sedentary habits into

E-mail address: malhumaid@kfu.edu.sa.

<https://doi.org/10.1016/j.heliyon.2024.e29351>

Received 26 December 2023; Received in revised form 10 February 2024; Accepted 5 April 2024

Available online 6 April 2024

2405-8440/© 2024 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

adulthood is harmful to future health and quality of life [9,10].

However, children with disabilities have significant obstacles in attaining the suggested daily minimum level of PA (60 min of moderate-to-vigorous PA *per day*) and frequently fall short of meeting this requirement [11]. Frey et al. [12] and more recently Jung et al. [13] confirm that children with disabilities participate in PA to a lesser extent than those without disabilities; the reasons for this are intricate and complex [14]. Donnelly et al. [15] stressed the importance of all children, including those with disabilities, engaging in regular PA due to its wide range of benefits, such as physical and mental health development. In studies investigating the reasons for the poor participation of children with disabilities in PA, the *barriers* to participation have been studied more comprehensively than the *facilitators* of participation. For example, barriers to participation in PA among children with disabilities include factors such as poor parental knowledge of the benefits of PA and how to access PA opportunities, the PA-related preferences of children with disabilities, fear related to engaging in PA on the part of parents of children with disabilities and the children themselves, poor parental behavior in relation to PA, negative attitudes towards those with disabilities participating in PA, inadequate facilities, transportation limitations, program and staff capacity inadequacies, and financial constraints [14].

Among the few studies that have investigated the facilitators of PA among children with disabilities, factors such as the involvement of peers, accessible facilities, proximity to sports facilities, and family support have been identified as significant. Of these, family and parental support have been identified as the most important facilitators of participation in PA among children with disabilities [16]. Parents play a crucial role in shaping the health-related behaviors of their children; parental support has emerged as a key influencer of children's PA behaviors [17]. Parental support — defined as the functional attributes associated with interactions between parents and children in intentional engagement, encouragement, discussion, and facilitation of opportunities related to PA [17] — has been extensively studied in the context of children without disabilities [17–19]. However, there is a noticeable gap in the literature concerning the significance of parental support in fostering PA in children with disabilities [20,21]. This gap means that we have a very limited understanding of how parents influence the PA behaviors of their children with disabilities. In a qualitative interview-based study of the parents of children with disabilities in Australia, Shields and Synnot [22] found that most parents not only acknowledged the benefits of PA for their children but also expressed a willingness for their children to actively engage in PA.

Despite these positive attitudes towards PA among the parents of children with disabilities, the primary challenge lies in translating these intentions into action while balancing the diverse needs of children with disabilities and identifying suitable programs for them. Furthermore, negative perceptions and opinions of PA among the parents of children with disabilities can directly impact the level of PA engaged in by their offspring. For example, the parents of children with disabilities who do not believe that PA is beneficial tend to perceive more obstacles to supporting their offspring to engage in PA [23,24]. Therefore, although parental support remains a significant predictor of PA in children with disabilities [25], the factors influencing this type of support remain underexplored.

The recent literature has identified several factors that determine parental support for PA among the parents of children with disabilities. Ku et al. [26] examined three factors: (i) parental enjoyment of PA, (ii) parental importance attributed to PA, and (iii) parental PA-related behaviors. Their findings underscore the significant role of parental beliefs towards PA, particularly the importance parents place on PA, as a predictor of parental encouragement of PA for their children. Moreover, parental enjoyment of PA and parental PA-related behaviors were found to be closely tied to co-PA in which both the parents and their children participate. Meanwhile, parental importance attributed to PA and PA-related behaviors is correlated with a willingness to provide logistic support (i.e., offering lifts to sports clubs) to enable their children to engage in PA opportunities. These findings highlight the intricate nature of parental influence on PA among children with disabilities and offer valuable guidance for developing tailored interventions and support systems to encourage children with disabilities to become more involved in PA of all types. Furthermore, there is evidence to suggest that there are differences in how parental influences affect the PA behaviors of children with disabilities compared to those without disabilities. For example, Siebert et al. [25] observed that the parents of children with disabilities tend to exert less influence over their child's PA behaviors compared to those with children without disabilities. However, a comparable study by Loprinzi et al. [27] found the opposite. Financial solvency also plays a crucial role in influencing parental support for PA in those with children with disabilities [16]. Specifically, parents on higher incomes tend to offer greater support to their children in relation to engaging in PA by providing equipment and covering participation fees, thereby enhancing their children's engagement in PA. Additionally, factors such as the age of the children [16], the nature of the disability [28], and parental educational background [29] all determine how much support the parents of children with disabilities offer their children in relation to engaging in PA.

The global focus on promoting PA among children with disabilities is growing, as it is recognized to have numerous physical and psychological advantages [16,30]. Nevertheless, in Saudi Arabia, there is a lack of sufficient studies investigating the levels of PA and associated characteristics among individuals with impairments [31]. The limited research conducted in this field has primarily concentrated on PA in individuals diagnosed with Down syndrome. Alhusaini et al. [32] examined the PA levels in children diagnosed with Down syndrome and compared them to those of typically developing children. This study found that children with Down syndrome had lower levels of prescribed PA compared to children without Down syndrome, and they also had a higher body mass index (BMI). Alwahaibi and Aldughishem [33] as well as Alghamdi et al. [34] conducted research on the perspectives of mothers on PA in Saudi children with Down Syndrome. They examined the PA levels, requirements, advantages of PA, factors that aid or hinder the care of their children, and emphasized the necessity of enhancing PA in children with Down syndrome. To the best of our knowledge, no research has been conducted on the topic of parental support for PA and the factors related to parental support for PA among parents of children with various disabilities in Saudi Arabia. Therefore, to address this research gap in the Saudi Arabian context, the following research questions (RQs) were formulated.

RQ1 To what extent do parents of children with disabilities in Saudi Arabia encourage their offspring to participate in PA?

RQ2 What exogenous demographic factors predict parental support for PA in Saudi Arabian parents of children with disabilities?

To address these RQs, the researcher aimed to (i) measure parental support among Saudi Arabian parents of children with disabilities in relation to facilitating their children to engage in PA, and (ii) examine the demographic factors associated with parental support among Saudi Arabian parents of children with disabilities in relation to facilitating their children to engage in PA. These factors encompassed parental characteristics (age, gender, educational background, special education degree, participation in PA, awareness of legislation/policies regarding children with disabilities), characteristics of children with disabilities (age, gender, disability status, sports club membership, school attendance), and family factors (income, urban/rural residence, number of disabled children in the household, and number of total children in the household). Such baseline data is essential to enable Saudi Arabian health and disability stakeholders (legislators and decision-makers) to improve existing initiatives designed to encourage the parents of children with disabilities to increase PA levels in their offspring as well as formulate new interventions to achieve this goal. The researcher aims to secure unfettered access for children with disabilities in Saudi Arabia to participate in PA via enlisting their parents' support. Ultimately, it is hoped that findings will provide new empirical data that will enhance PA levels among Saudi Arabian children in each locality of the country.

2. Methods

2.1. Procedures

To investigate how parental orientation (parental PA behaviours, parental PA enjoyment, and parental perceptions of the importance of PA) influences their support for their child's PA behaviour, the Parental Physical Activity Support Questionnaire for Parents of Children with Disabilities (PPSQ for PCD) was employed. Since the PPSQ for PCD is provided exclusively in English [26], and the participants in the current study were Arabic speakers, the questionnaire was first translated into Arabic, the official language of Saudi Arabia, adjusted to the Saudi context, and validated according to the clear and user-friendly principles established by Sousa and Rojjanasrirat [35]. Subsequently, the Arabic version of the PPSQ for PCD (PPSQ for PCD-AR) was made available on Google Forms and distributed to participants for online completion via the specified URL link. The distribution of the PPSQ for PCD-AR was conducted either through the child's school or the specialist institute they attend. The delivery method involved sending a letter with an information sheet that outlined the study's objectives, a URL link to access the survey, and an informed consent form that parents had to sign after agreeing to take part in our research. Furthermore, explicit guidelines for filling out the questionnaire were provided. A total of 400 letters were distributed, with 200 letters addressed to fathers and 200 letters delivered to mothers. Data collection took place between April 15–June 31, 2023. Participants were informed of their right to withdraw from the study at any point without citing a reason for doing so; all data were recorded anonymously. Ethical approval for the study was granted by the Research Ethics Committee at King Faisal University (KFU-REC-2023-JAN-ETHICS783).

2.2. Participants

A total of 250 parents consented to take part in the study (fathers: $n = 125$; mothers: $n = 125$; Mage = 42.48; SD = 8.19), resulting in a response rate of 62.5 %. The eligibility criteria were as follows: being a parent aged 18 and above, having a child aged 5–12 years old with a disability (e.g., a physical disability, Down syndrome, autism spectrum disorder), living in the Eastern region of Saudi Arabia, and being able to read and answer the questionnaire independently. Parents of children with chronic or acute illnesses or injuries that made PA unsafe were also excluded from the research. After assessing the responses, 11 participants (2 fathers and 9 mothers) were excluded due to incorrect answers. The final dataset includes 239 participants, 123 fathers and 116 mothers, with an effective recovery rate of 59.75 %. This sample is ample and surpasses the minimum needed size of 111 people. The statistical power assessments were performed using G*Power 3.1.9.7 software. The input values utilized were $\alpha = 0.05$, power = 0.95, and mean effect size = 0.3, as stated by Faul et al. [36].

2.3. Research Instrument

2.3.1. Demographic survey

The participant demographic survey collected information regarding the age and gender of the parents, the parents' educational attainment, their level of involvement in PA, their level of expertise in special education, and their familiarity with legislation and regulations relevant to children with disabilities. Additionally, demographic information regarding children with disabilities was gathered, including their age, gender, disability status, involvement in sports organizations, and school attendance. Subsequently, the household variables were collected, which included income, rural or urban residence, the number of disabled children, and the overall count of children.

2.3.2. The Parental Physical Activity Support Questionnaire for Parents of Children with disabilities (PPSQ for PCD)

To measure parental support for PA among the participating parents of children with disabilities, the PPSQ for PCD [26] was utilized in this study. Developed by Ku et al. [26], the PPSQ for PCD is based on a systematic review study examining questionnaires measuring parental support for PA. The PPSQ for PCD comprises three constructs (*encouragement*, *co-PA*, and *logistic support*), each of which is assessed by four question items (a total of 12 items). The PPSQ for PCD begins with the following question: "During a typical week, how often do you provide the following types of support for your child's PA or sports?". Examples of the response items include: (i) "Encourage my child to participate in PA" (*encouragement*); (ii) "Tell my child that PA or sports are good for their health"

(*encouragement*); (iii) “Participate in PA with my child” (*co-PA*); (iv) “Use PA as a form of family recreation” (*co-PA*); (v) “Provide transportation so my child can go to a place where they can engage in PA” (*logistic support*); (vi) “Take my child to places where they can engage in APs” (*logistic support*). Each participant’s answers were assessed using a six-point Likert scale (*Never = 1; Less than once a week = 2; 1–2 times per week = 3; 3–4 times per week = 4; 5–6 times per week = 5; Daily = 6*).

The overall level of parental support for PA in their offspring with disabilities was determined by averaging the scores of the 12 questionnaire items. Specific scores for encouragement, co-activity planning, and logistical support were also determined by averaging the scores of the specific items for each component. Elevated participant scores reflect greater levels of parental support for PA in their offspring with disabilities.

2.3.3. Translation of the PPSQ for PCD

As suggested by Susa and Rojjanasrirat [35], two skilled native Arabic speakers who were also fluent in English translated the scale from English to Arabic. Subsequently, the two Arabic translators collaborated to examine the two copies to identify any disparities, retaining only a single copy. Two Saudi university instructors, who are native English speakers from the United States or another English-speaking country, independently and without prior knowledge, retranslated the predetermined Arabic version into English. The focus of the translation was on capturing the meaning of each item rather than producing a literal translation. Afterwards, the accuracy of both the English and Arabic translations was compared, and any necessary revisions were made. No items were deleted during the translation process. Finally, six Saudi academics who specialize in physical education ($N = 3$) and adaptive PA ($N = 3$) were recruited. These experts evaluated the accuracy of the scale’s translation and made recommendations on its face and content validity. After reviewing all expert opinions, the translated scale was finalized and sent out for pilot testing.

2.3.4. Reliability and validity of the scale

A panel of six research specialists examined the face and content validity of the PPSQ for PCD-AR. Three members of this panel possess distinct expertise in sports and physical education, while the remaining three members possess specialist knowledge in adapted PA. The selection process was conducted based on the candidates’ expertise in specific areas, research interests, and prior experience in activities related to evaluating measurement scales and content validity. Based on their comprehensive knowledge of PA theories, the experts evaluated the face validity of the PPSQ for PCD-AR by determining if it accurately measured support for PA in parents of children with disabilities. Additionally, they evaluated the content validity of the scale and its components, particularly regarding its capacity to gauge the level of support for PA in Arabic-speaking parents of children with disabilities. The experts were requested to provide distinct scores to each item, with 1 indicating irrelevance, 2 indicating marginal relevance, 3 indicating moderate relevance, and 4 indicating high relevance. The scores obtained were subsequently transformed into binary values, with 0 representing a relevance scale of 1–2 and 1 representing a relevance scale of 3–4. Subsequently, the following metrics were computed: the content validity index (CVI) for each individual item (I-CVI), the average of the I-CVI scores across all items on the scale (S-CVI/Ave), and the percentage of items on the scale that received a relevance scale of 3 or 4 from the six experts (S-CVI/UA). The S-CVI/Ave value is 0.97, the S-CVI/UA value is 0.84, and the I-CVI values vary from 0.85 to 1. The results indicate that the PPSQ for PCD-AR has attained a satisfactory level of content validity [37].

Subsequently, a preliminary investigation of the PPSQ for PCD-AR was conducted on a sample of 59 parents with at least one disabled family members. The research sample consisted of 47 mothers (79.66 %) and 12 fathers (20.34 %) aged 26–56 years old; their mean age was 39.59 years old with a standard deviation of 8.10 years. The PPSQ for PCD-AR questionnaire was distributed to the participants along with instructions on noting down in the margins next to each question item any difficulties they encountered in understanding or completing any sections of the questionnaire. The construct validity of the PPSQ for PCD-AR was assessed using principal component analysis (PCA). The Kaiser-Meyer-Olkin (KMO) statistic, which measures sample adequacy, yielded a score of 85.2 %, indicating a significant level of adequacy. Additionally, Bartlett’s test of sphericity produced a statistically significant result ($p < 0.001$), indicating significant intercorrelations among the variables with a commonality score of >30 %. The results of the PCA performed on the questionnaire item scores revealed that the 12 items formed a three-dimensional construct. Combined, the three components (*encouragement*, *co-PA*, and *logistic support*) accounted for 80.184 % of the overall variability observed in the sample. Load factor analysis indicated that each of these three components has a substantial impact on parental support for PA in Saudi Arabian parents of children with disabilities. This suggests that the PPSQ for PCD-AR accurately measures the level of parental support for PA among parents of disabled children in Saudi Arabia. The reliability of the PPSQ for PCD-AR was assessed using Cronbach’s alpha test which produced satisfactory results. The overall reliability coefficient of the scale was $\alpha = 0.936$. The subscales *encouragement* ($\alpha = 0.909$), *co-PA* ($\alpha = 0.896$), and *logistic support* ($\alpha = 0.907$) exhibited the highest reliability coefficients. Therefore, the PPSQ for PCD-AR was deemed to be an effective and reliable method for assessing parental support for PA for children with disabilities in the Saudi Arabian context.

2.4. Data analysis

The normality of the data distribution and residuals was evaluated using the Shapiro-Wilk test. The results indicated that the dependent variables showed non-normal distributions: *Co-PA* ($p = 0.003$), PPSQ for PCD-AR ($p = 0.006$), and the remainder ($p = 0.001$). Outliers in the dataset were removed by using gender-specific Z-scores. Values that had Z-scores greater than 3 or less than -3 were identified as outliers and replaced with the specific mode value. The Box’s M test was conducted to assess the equality of covariance matrices, revealing significant differences in both variance and covariance matrices ($p = 0.001$ for all). Variance inflation factors (VIFs) were employed to examine the problem of multicollinearity. All variables had values below 3, indicating a low level of

Table 1

Parental support for physical activity in children with disabilities among the participants by demographic variables.

| | | N | Mean | SD | p | Model Effects | |
|---------------------------------------------------------------------------------------------------------|------------------------------|-----|------|------|-------|---------------|-------|
| | | | | | | Wald χ^2 | Sig. |
| (Intercept) | | | | | | 68.386 | 0.001 |
| Age of parent | | | | | | 12.489 | 0.001 |
| Relationship with child * | Father | 123 | 2.81 | 1.31 | 0.281 | 22.722 | 0.001 |
| | Mother | 116 | 2.57 | 0.89 | | | |
| Parental educational background | Elementary school | 19 | 2.20 | 1.45 | 0.006 | 16.881 | 0.005 |
| | Middle school | 20 | 3.96 | 1.98 | | | |
| | High school | 64 | 2.97 | 1.33 | | | |
| | College (2 years) | 18 | 3.35 | 1.30 | | | |
| | College (4 years) | 88 | 3.10 | 1.20 | | | |
| | Above college-level | 30 | 3.72 | 1.79 | | | |
| Does the parent hold a degree in special education? | No | 220 | 2.66 | 1.12 | 0.126 | 0.024 | 0.877 |
| | Yes | 19 | 3.09 | 1.18 | | | |
| Does the parent engage in physical activities or sports themselves? | No | 91 | 2.08 | 0.77 | 0.001 | 73.269 | 0.001 |
| | Yes, 1–2 days a week | 79 | 2.72 | 0.98 | | | |
| | Yes, 3–4 days a week | 31 | 3.33 | 1.34 | | | |
| | Yes, more than 4 days a week | 38 | 3.60 | 1.10 | | | |
| Family income (per annum) | Don't want to answer | 28 | 2.82 | 1.09 | 0.007 | 10.457 | 0.063 |
| | Less than \$20,000 | 77 | 2.60 | 1.24 | | | |
| | \$20,000 to \$34,999 | 64 | 2.38 | 1.00 | | | |
| | \$35,000 to \$49,999 | 36 | 3.01 | 1.02 | | | |
| | \$50,000 to \$74,999 | 27 | 3.02 | 1.22 | | | |
| | \$75,000 or more | 7 | 3.27 | 0.44 | | | |
| Age of child with a disability (years) | 5 | 29 | 2.88 | 0.95 | 0.001 | 64.808 | 0.001 |
| | 6 | 33 | 2.39 | 1.06 | | | |
| | 7 | 27 | 1.95 | 0.75 | | | |
| | 8 | 17 | 3.72 | 1.27 | | | |
| | 9 | 31 | 2.61 | 0.76 | | | |
| | 10 | 22 | 2.97 | 1.26 | | | |
| | 11 | 80 | 2.75 | 1.20 | | | |
| Sex of the child with a disability | Boy | 151 | 2.77 | 1.21 | 0.277 | 0.014 | 0.904 |
| | Girl | 88 | 2.56 | 0.97 | | | |
| Child's disability status | Autism spectrum disorder | 72 | 3.10 | 1.24 | 0.001 | 34.050 | 0.001 |
| | Cerebral palsy | 15 | 2.22 | 1.37 | | | |
| | Visual/hearing impairment | 10 | 2.99 | 0.80 | | | |
| | Down syndrome | 67 | 2.83 | 1.13 | | | |
| | Learning disability | 21 | 1.96 | 0.57 | | | |
| | Mental disorder | 14 | 2.57 | 0.74 | | | |
| | Physical disability | 25 | 2.50 | 0.78 | | | |
| | Other | 15 | 1.92 | 0.88 | | | |
| Does the child with a disability belong to a sports club? | No | 223 | 2.60 | 1.10 | 0.001 | 18.584 | 0.001 |
| | Yes | 16 | 3.96 | 0.79 | | | |
| Does the child with a disability attend school? | No | 41 | 2.72 | 1.17 | 0.072 | 6.603 | 0.086 |
| | Yes, private school | 16 | 2.97 | 1.08 | | | |
| | Yes, special school | 122 | 2.79 | 1.11 | | | |
| | Yes, public school | 60 | 2.42 | 1.14 | | | |
| Area of residence | Urban | 191 | 2.70 | 1.17 | 0.665 | 0.321 | 0.571 |
| | Rural | 48 | 2.69 | 0.96 | | | |
| Does the parent know about legislation or policies related to the rights of children with disabilities? | None | 42 | 2.15 | 1.28 | 0.001 | 15.024 | 0.005 |
| | Poor | 56 | 2.34 | 0.98 | | | |
| | Average | 75 | 2.81 | 1.01 | | | |
| | Good | 52 | 3.19 | 1.13 | | | |
| | Very good | 14 | 3.28 | 0.66 | | | |
| How many children does the family have? | 1 | 15 | 2.52 | 0.81 | 0.001 | 35.678 | 0.001 |
| | 2 | 41 | 2.73 | 1.36 | | | |
| | 3 | 33 | 2.50 | 0.76 | | | |
| | 4 | 42 | 2.85 | 0.88 | | | |
| | 5 | 55 | 3.20 | 1.18 | | | |
| | More than 5 | 53 | 2.19 | 1.13 | | | |
| How many children with a disability are in the family? | One | 204 | 2.73 | 1.13 | 0.294 | 0.035 | 0.853 |
| | Two or more | 35 | 2.50 | 1.15 | | | |

Note: SD, standard deviation; Wald χ^2 , Wild chi-square.

correlation between the independent variables. A scatterplot matrix with LOESS lines was plotted to examine the linear relationships between parental support for PA and age. The result of Levene’s test was statistically significant, indicating that the assumption of equal error variance was not satisfied among the different groups. Consequently, a generalized linear model was utilized to demonstrate the association between the investigated demographic variables and parental support for PA, with the participants’ age included as a covariate. Model reduction was performed by eliminating statistically insignificant components to improve precision and simplify the models. By analyzing the impact of the demographic variables on parental support for PA, including *encouragement*, *co-PA*, and *logistic* support, the significance of the final models was determined. Beta coefficients, standard errors, 95 % confidence intervals, and Wald chi-square statistics were used as parameters in the models.

Furthermore, the Mann-Whitney *U* test was employed to make comparisons between two independent samples stratified based on the affiliation with the child who has a disability (Father/Mother), whether parents hold a degree in special education (Yes/No), the gender of the child with disability (Boy/Girl), whether the child is a member of a sports club (Yes/No), whether parents live in an urban or rural area (rural/urban), and the number of children with a disability in the household (One/two or more). The Kruskal-Wallis test was employed to compare k-independent samples, which were categorized according to the parents’ educational background (6 possibilities), whether parents participate in PA themselves (4 choices), the family income (6 choices), the age of the child with a disability (7 choices), the disability status of the child (8 choices), whether the child attends school (4 choices), whether the parents are aware of legislation or policies related to the rights of children with disabilities (5 alternatives), and the number of children without a disability in the household (6 alternatives). The statistical analyses were conducted using the SPSS Statistics package version 26.0 (IBM Corp., Chicago, IL, USA) with a predetermined statistical significance level of $p < 0.05$.

3. Results

3.1. Overall support

Table 1 presents the levels of support for PA among the Saudi Arabian parents of children with disabilities according to their demographic characteristics, as well as the effects of these variables on the parental levels of support for PA. The average overall parental support score for PA was 2.3 ± 1.12 , falling within the projected cut-off range of 1.84–2.67. This suggests that parental support for assisting their offspring to engage in PA typically occurs less than once a week.

Statistically significant variations were observed based on parents’ educational background, parental engagement in PA/sports, family income level, the age of the disabled children, the specific type of disability the child has, the child’s involvement in a sports club, parents’ awareness of legislation or policies regarding the rights of disabled children, and the number of children in the family (parents’ educational background: $p = 0.006$; family income level: 0.007; remaining variables: 0.001).

A linear model was used to estimate the effects of the demographic factors on parental support for PA among the parents of children with disabilities (see Table 2). The linear model employs link functions and Gaussian distributions resulting in a generalized linear model for the continuous dependent variables. The Pearson χ^2 statistics, divided by the residual degrees of freedom, increased from 0.561 in the whole model to 0.714 in the reduced model. Parental age had a minor yet noteworthy influence on the relationship between parental support for their children’s engagement in PA and the aforementioned independent factors (Wald $\chi^2 = 4.106$; $p = 0.043$). Parents who had either a two-year or four-year college degree demonstrated higher levels of support for PA in their children with disabilities, with B values of 0.644 and 0.570, respectively. Having a child with a diagnosis of autism spectrum disorder ($\beta = 0.969$), deafness/hard of hearing ($\beta = 1.027$), Down’s syndrome ($\beta = 1.138$), or a physical disability ($\beta = 0.800$) increased parental

Table 2

Estimation of the model parameters relative to the overall support physical activity in children with disabilities among participants.

| Parameter | B | SE | 95 % Wald CI | | | Sig. |
|------------------------------------------------------------------------------------------------------------------|--------------------|--------|--------------|--------|---------------|-------|
| | | | Lower | Upper | Wald χ^2 | |
| (Intercept) | 4.966 | 0.8265 | 3.346 | 6.586 | 36.100 | 0.000 |
| [Educational background of parent = College (2 years)] | 0.644 | 0.2783 | 0.099 | 1.190 | 5.354 | 0.021 |
| [Educational background of parent = College (4 years)] | 0.570 | 0.2769 | 0.027 | 1.113 | 4.235 | 0.040 |
| [Does the parent engage in physical activities or sports? = No] | -1.381 | 0.1762 | -1.726 | -1.036 | 61.450 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 1–2 days a week] | -0.866 | 0.1858 | -1.230 | -0.502 | 21.749 | 0.000 |
| [Age of child with a disability = 7] | -0.967 | 0.2014 | -1.362 | -0.572 | 23.062 | 0.000 |
| [Age of child with a disability = 9] | -0.589 | 0.1925 | -0.967 | -0.212 | 9.377 | 0.002 |
| [Child disability status = autism spectrum disorder] | 0.969 | 0.2445 | 0.489 | 1.448 | 15.691 | 0.000 |
| [Child disability status = Deaf/hard of hearing] | 1.027 | 0.3456 | 0.349 | 1.704 | 8.823 | 0.003 |
| [Child disability status = Down syndrome] | 1.138 | 0.2478 | 0.652 | 1.623 | 21.082 | 0.000 |
| [Child disability status = Physical disability] | 0.800 | 0.3151 | 0.183 | 1.418 | 6.448 | 0.011 |
| [Does the child with a disability belong to a sports club? = No] | -0.926 | 0.2379 | -1.392 | -0.460 | 15.142 | 0.000 |
| [Does the parent know about legislation or policies related to the rights of children with disabilities? = Poor] | -0.569 | 0.2556 | -1.070 | -0.068 | 4.963 | 0.026 |
| [How many children are in the family? = 2] | -0.517 | 0.2477 | -1.002 | -0.032 | 4.357 | 0.037 |
| Age of parent | -0.024 | 0.0121 | -0.048 | -0.001 | 4.106 | 0.043 |
| (Scale) | 0.529 ^b | 0.0484 | 0.442 | 0.633 | | |

Note: β , beta; SE, standard error; Wald χ^2 , Wald chi-square.

Table 3

Parental encouragement of physical activity in children with disabilities according to the demographic variables.

| | | N | Mean | SD | p | Model effects | |
|---------------------------------------------------------------------------------------------------------|------------------------------|-----|------|------|-------|---------------|-------|
| | | | | | | Wald χ^2 | Sig. |
| (Intercept) | | | | | | 31.64 | 0.001 |
| Age of parent | | | | | | 2.350 | 0.125 |
| Relationship with child * | Father | 123 | 3.29 | 1.63 | 0.328 | 9.575 | 0.002 |
| | Mother | 116 | 3.03 | 1.27 | | | |
| Parental educational background | Elementary school | 19 | 2.20 | 1.45 | 0.012 | 14.108 | 0.015 |
| | Middle school | 20 | 3.96 | 1.98 | | | |
| | High school | 64 | 2.97 | 1.33 | | | |
| | College (2 years) | 18 | 3.35 | 1.30 | | | |
| | College (4 years) | 88 | 3.10 | 1.20 | | | |
| | Above college-level | 30 | 3.72 | 1.79 | | | |
| Does the parent hold a degree in special education? | No | 220 | 3.14 | 1.47 | 0.250 | 0.043 | 0.835 |
| | Yes | 19 | 3.47 | 1.41 | | | |
| Does the parent engage in physical activities or sports themselves? | No | 91 | 2.45 | 1.14 | 0.001 | 50.307 | 0.001 |
| | Yes, 1–2 days a week | 79 | 3.11 | 1.28 | | | |
| | Yes, 3–4 days a week | 31 | 4.20 | 1.54 | | | |
| | Yes, more than 4 days a week | 38 | 4.13 | 1.48 | | | |
| Family income (per annum) | Don't want to answer | 28 | 3.12 | 1.44 | 0.146 | 14.216 | 0.014 |
| | Less than \$20,000 | 77 | 2.98 | 1.61 | | | |
| | \$20,000 to \$34,999 | 64 | 3.10 | 1.41 | | | |
| | \$35,000 to \$49,999 | 36 | 3.67 | 1.33 | | | |
| | \$50,000 to \$74,999 | 27 | 3.20 | 1.49 | | | |
| | \$75,000 or more | 7 | 3.07 | 0.77 | | | |
| Age of child with a disability (years) | 5 | 29 | 3.60 | 1.59 | 0.001 | 43.856 | 0.001 |
| | 6 | 33 | 2.65 | 1.57 | | | |
| | 7 | 27 | 2.44 | 1.11 | | | |
| | 8 | 17 | 4.34 | 1.38 | | | |
| | 9 | 31 | 3.17 | 1.02 | | | |
| | 10 | 22 | 3.35 | 1.68 | | | |
| | 11 | 80 | 3.15 | 1.42 | | | |
| Sex of the child with a disability | Boy | 151 | 3.23 | 1.57 | 0.825 | 0.053 | 0.819 |
| | Girl | 88 | 3.04 | 1.28 | | | |
| Child's disability status | Autism spectrum disorder | 72 | 3.60 | 1.49 | 0.005 | 23.425 | 0.001 |
| | Cerebral palsy | 15 | 2.98 | 1.97 | | | |
| | Visual/hearing impairment | 10 | 3.40 | 1.59 | | | |
| | Down syndrome | 67 | 3.24 | 1.53 | | | |
| | Learning disability | 21 | 2.49 | 0.69 | | | |
| | Mental disorder | 14 | 3.09 | 1.15 | | | |
| | Physical disability | 25 | 2.97 | 1.26 | | | |
| | Other | 15 | 2.03 | 0.94 | | | |
| Does the child with a disability belong to a sports club? | No | 223 | 3.03 | 1.38 | 0.001 | 17.897 | 0.001 |
| | Yes | 16 | 5.05 | 1.35 | | | |
| Does the child with a disability attend school? | No | 41 | 3.15 | 1.51 | 0.955 | 2.465 | 0.482 |
| | Yes, private school | 16 | 3.61 | 1.72 | | | |
| | Yes, special school | 122 | 3.15 | 1.46 | | | |
| | Yes, public school | 60 | 3.08 | 1.40 | | | |
| Area of residence | Urban | 191 | 3.13 | 1.52 | 0.250 | 0.022 | 0.881 |
| | Rural | 48 | 3.27 | 1.26 | | | |
| Does the parent know about legislation or policies related to the rights of children with disabilities? | None | 42 | 2.50 | 1.54 | 0.001 | 15.785 | 0.003 |
| | Poor | 56 | 2.79 | 1.48 | | | |
| | Average | 75 | 3.34 | 1.24 | | | |
| | Good | 52 | 3.68 | 1.51 | | | |
| | Very good | 14 | 3.71 | 1.17 | | | |
| How many children does the family have? | 1 | 15 | 2.67 | 1.05 | 0.001 | 31.550 | 0.001 |
| | 2 | 41 | 3.29 | 1.56 | | | |
| | 3 | 33 | 3.08 | 1.09 | | | |
| | 4 | 42 | 3.65 | 1.36 | | | |
| | 5 | 55 | 3.51 | 1.41 | | | |
| | More than 5 | 53 | 2.50 | 1.60 | | | |
| How many children with a disability are in the family? | One | 204 | 3.22 | 1.43 | 0.061 | 0.149 | 0.700 |
| | Two or more | 35 | 2.84 | 1.67 | | | |

Note: SD, standard deviation; Wald χ^2 , Wild chi-square.

support for PA in children with disabilities. However, parents who do not engage in PA/sports themselves ($\beta = -1.381$) or only do so 1–2 days a week ($\beta = -0.866$), or have inadequate knowledge of legislation or policies pertaining to the rights of children with disabilities ($\beta = -0.585$) provided less support to their children with disabilities to participate in PA. The presence of two children in the household ($\beta = -0.517$) or having a child with a disability who does not participate in a sports club ($\beta = -0.926$) had a detrimental impact on parental support for their children with disabilities to engage in PA. Parental support for children with a disability to engage in PA was significantly reduced in those with children aged 7 years old ($\beta = -0.967$) and 9 years old ($\beta = -0.589$).

3.2. Parental encouragement

Table 3 presents the level of parental encouragement for PA among parents of children with disabilities in terms of the demographic factors investigated. It also illustrates the impact of these factors on the amount of encouragement provided. The mean total encouragement score was 3.16 ± 1.147 , falling within the expected cut-off range of 2.68–3.51. This indicates that parental encouragement for PA in participants with children with disabilities generally occurs less frequently than twice a week.

Significant statistical differences were found in relation to parents' educational background, parental participation in PA/sports, the age of their disabled offspring, the specific type of disability the child has, the child's involvement in a sports club, parental knowledge of legislation or policies regarding the rights of disabled children, and the number of children in the family (parental educational background: $p = 0.006$; family income level: 0.007; remaining factors: 0.001). Pearson χ^2 statistics, divided by the residual degrees of freedom, decreased from 1.098 in the full model to 1.072 in the reduced model. The age of the participants had no impact on the relationship between parental encouragement for their children's engagement in PA and the independent characteristics mentioned above (Wald $\chi^2 = 2.350$; $p = 0.125$).

The findings also indicate that fathers (rather than mothers) are more likely to encourage their children with disabilities to engage in PA, leading to a 0.598 increase in the likelihood of the children engaging in PA. The degree of encouragement increased by 0.896 for families with an income of between \$20,000–\$34,999 per annum, and by 0.935 for families with an income between \$35,000–\$49,999. Having a child with a diagnosis of autism spectrum disorder ($\beta = 1.350$), cerebral palsy ($\beta = 1.152$), deafness/hard of hearing ($\beta = 1.48$), Down's syndrome ($\beta = 1.386$), or a mental disorder ($\beta = 1.057$) resulted in higher levels of parental encouragement for PA in children with disabilities. Parents were more likely to encourage their children with disabilities who were aged 5 years old ($\beta = 0.693$) or had three siblings ($\beta = 0.767$) to engage in PA. However, parents who do not participate in PA/sports themselves ($\beta = -1.485$) or only do so 1–2 days a week ($\beta = -1.084$), or lack sufficient knowledge of legislation or policies related to the rights of children with disabilities ($\beta = -0.803$) provided less encouragement to their children with disabilities to engage in PA. Parents of children aged 7 years old ($\beta = -0.985$), 9 years old ($\beta = -0.529$), and parents of children with disabilities who do not participate in a sports club ($\beta = -1.404$) were less likely to encourage them to engage in PA (see Table 4).

3.3. Co-physical activity

The data on co-PA revealed a mean score of 2.63 ± 1.26 , falling within the estimated cut-off range of 1.84–2.67. These findings indicate that Saudi Arabian parents of children with disabilities engage in co-PA infrequently — less than once a week.

Table 4
Estimation of the model parameters related to parental encouragement for physical activity in children with disabilities.

| Parameter | B | SE | 95 % Wald CI | | Wald χ^2 | Sig. |
|------------------------------------------------------------------------------------------------------------------|--------------------|--------|--------------|--------|---------------|-------|
| | | | Lower | Upper | | |
| (Intercept) | 4.848 | 1.2387 | 2.420 | 7.276 | 15.317 | 0.000 |
| [Relationship with child = Father] | 0.598 | 0.1762 | 0.253 | 0.944 | 11.530 | 0.001 |
| [Educational background of parent = middle school] | 0.934 | 0.4185 | 0.114 | 1.755 | 4.984 | 0.026 |
| [Does the parent engage in physical activities or sports? = No] | -1.485 | 0.2335 | -1.942 | -1.027 | 40.419 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 1–2 days a week] | -1.084 | 0.2521 | -1.579 | -0.590 | 18.504 | 0.000 |
| [Family income (per annum) = \$20,000 to \$34,999] | 0.896 | 0.4409 | 0.032 | 1.760 | 4.131 | 0.042 |
| [Family income (per annum) = \$35,000 to \$49,999] | 0.935 | 0.4340 | 0.085 | 1.786 | 4.645 | 0.031 |
| [Age of child with a disability = 5] | 0.693 | 0.2633 | 0.177 | 1.209 | 6.924 | 0.009 |
| [Age of child with a disability = 7] | -0.985 | 0.2764 | -1.527 | -0.443 | 12.700 | 0.000 |
| [Age of child with a disability = 9] | -0.529 | 0.2613 | -1.041 | -0.016 | 4.092 | 0.043 |
| [Child disability status = autism spectrum disorder] | 1.350 | 0.3224 | 0.718 | 1.982 | 17.533 | 0.000 |
| [Child disability status = Cerebral palsy] | 1.152 | 0.4212 | 0.326 | 1.977 | 7.476 | 0.006 |
| [Child disability status = Deaf/hard of hearing] | 1.480 | 0.4541 | 0.590 | 2.370 | 10.626 | 0.001 |
| [Child disability status = Down syndrome] | 1.386 | 0.3332 | 0.733 | 2.039 | 17.301 | 0.000 |
| [Child disability status = Mental disorder] | 1.057 | 0.4313 | 0.212 | 1.903 | 6.009 | 0.014 |
| [Does the child with a disability belong to a sports club? = No] | -1.404 | 0.3169 | -2.025 | -0.783 | 19.625 | 0.000 |
| [Does the parent know about legislation or policies related to the rights of children with disabilities? = Poor] | -0.803 | 0.3575 | -1.503 | -0.102 | 5.042 | 0.025 |
| [How many children does the family have? = 4] | 0.767 | 0.2749 | 0.229 | 1.306 | 7.797 | 0.005 |
| Age of parent | -0.030 | 0.0196 | -0.068 | 0.009 | 2.325 | 0.127 |
| (Scale) | 0.897 ^b | 0.0821 | 0.750 | 1.073 | | |

Note: β , beta; SE, standard error; Wald χ^2 , Wald chi-square.

Table 5
Parental co-physical activity with children with disabilities according to demographic variables.

| | | N | Mean | SD | p | Model effects | |
|---------------------------------------------------------------------------------------------------------|------------------------------|-----|------|------|-------|---------------|-------|
| | | | | | | Wald χ^2 | Sig. |
| (Intercept) | | | | | | 77.021 | 0.001 |
| Age of parent | | | | | | 19.315 | 0.001 |
| Relationship with child * | Father | 123 | 2.74 | 1.47 | 0.579 | 31.482 | 0.001 |
| | Mother | 116 | 2.50 | 0.97 | | | |
| Parental educational background | Elementary school | 19 | 1.96 | 1.06 | 0.004 | 13.288 | 0.021 |
| | Middle school | 20 | 3.26 | 1.77 | | | |
| | High school | 64 | 2.37 | 1.24 | | | |
| | College (2 years) | 18 | 2.46 | 0.90 | | | |
| | College (4 years) | 88 | 2.62 | 1.01 | | | |
| | Above college-level | 30 | 3.28 | 1.49 | | | |
| Does the parent hold a degree in special education? | No | 220 | 2.56 | 1.22 | 0.016 | 3.567 | 0.059 |
| | Yes | 19 | 3.37 | 1.49 | | | |
| Does the parent engage in physical activities or sports themselves? | No | 91 | 1.98 | 0.87 | 0.001 | 59.299 | 0.001 |
| | Yes, 1–2 days a week | 79 | 2.69 | 1.07 | | | |
| | Yes, 3–4 days a week | 31 | 3.27 | 1.75 | | | |
| | Yes, more than 4 days a week | 38 | 3.51 | 1.12 | | | |
| Family income (per annum) | Don't want to answer | 28 | 2.65 | 1.19 | 0.001 | 8.761 | 0.119 |
| | Less than \$20,000 | 77 | 2.61 | 1.34 | | | |
| | \$20,000 to \$34,999 | 64 | 2.22 | 1.18 | | | |
| | \$35,000 to \$49,999 | 36 | 2.89 | 0.97 | | | |
| | \$50,000 to \$74,999 | 27 | 3.12 | 1.45 | | | |
| | \$75,000 or more | 7 | 3.11 | 0.96 | | | |
| Age of child with a disability (years) | 5 | 29 | 3.07 | 1.31 | 0.001 | 79.169 | 0.001 |
| | 6 | 33 | 2.32 | 1.21 | | | |
| | 7 | 27 | 1.79 | 0.79 | | | |
| | 8 | 17 | 3.54 | 1.58 | | | |
| | 9 | 31 | 2.38 | 0.94 | | | |
| | 10 | 22 | 3.09 | 1.50 | | | |
| | 11 | 80 | 2.65 | 1.15 | | | |
| Sex of the child with a disability | Boy | 151 | 2.69 | 1.31 | 0.379 | 0.043 | 0.836 |
| | Girl | 88 | 2.51 | 1.16 | | | |
| Child's disability status | Autism spectrum disorder | 72 | 2.99 | 1.24 | 0.001 | 61.281 | 0.001 |
| | Cerebral palsy | 15 | 1.88 | 1.19 | | | |
| | Visual/hearing impairment | 10 | 3.15 | 0.72 | | | |
| | Down syndrome | 67 | 3.00 | 1.44 | | | |
| | Learning disability | 21 | 1.76 | 0.64 | | | |
| | Mental disorder | 14 | 2.46 | 0.94 | | | |
| | Physical disability | 25 | 2.14 | 0.83 | | | |
| | Other | 15 | 1.78 | 0.80 | | | |
| Does the child with a disability belong to a sports club? | No | 223 | 2.55 | 1.25 | 0.001 | 12.766 | 0.001 |
| | Yes | 16 | 3.73 | 0.77 | | | |
| Does the child with a disability attend school? | No | 41 | 2.51 | 1.08 | 0.002 | 19.593 | 0.001 |
| | Yes, private school | 16 | 2.89 | 1.22 | | | |
| | Yes, special school | 122 | 2.88 | 1.33 | | | |
| | Yes, public school | 60 | 2.12 | 1.08 | | | |
| Area of residence | Urban | 191 | 2.62 | 1.31 | 0.508 | 0.040 | 0.841 |
| | Rural | 48 | 2.65 | 1.05 | | | |
| Does the parent know about legislation or policies related to the rights of children with disabilities? | None | 42 | 2.02 | 1.36 | 0.001 | 12.817 | 0.012 |
| | Poor | 56 | 2.30 | 1.17 | | | |
| | Average | 75 | 2.73 | 1.09 | | | |
| | Good | 52 | 3.18 | 1.27 | | | |
| | Very good | 14 | 3.11 | 1.03 | | | |
| How many children does the family have? | 1 | 15 | 2.40 | 1.06 | 0.001 | 33.122 | 0.001 |
| | 2 | 41 | 2.60 | 1.30 | | | |
| | 3 | 33 | 2.41 | 0.91 | | | |
| | 4 | 42 | 2.67 | 0.91 | | | |
| | 5 | 55 | 3.24 | 1.36 | | | |
| | More than 5 | 53 | 2.17 | 1.39 | | | |
| How many children with a disability are in the family? | One | 204 | 2.64 | 1.24 | 0.475 | 0.175 | 0.676 |
| | Two or more | 35 | 2.54 | 1.39 | | | |

Note: SD, standard deviation; Wald χ^2 , Wild chi-square.

Statistically significant differences were observed among participants based on parental educational background ($p = 0.004$), parents with a diploma in special education ($p = 0.016$), family income level ($p = 0.001$), parental participation in PA/sports ($p = 0.016$), the age of the disabled child ($p = 0.001$), the child's specific type of disability ($p = 0.001$), the disabled child's membership of a sports club ($p = 0.001$), the disabled child's attendance at school ($p = 0.002$), parental knowledge of legislation or policies regarding the rights of disabled children ($p = 0.001$), and the number of children in the family ($p = 0.001$; see Table 5).

Pearson's χ^2 statistic, divided by the residual degrees of freedom, increased from 0.652 in the full model to 0.729 in the reduced model. Participant age had a significant impact on co-PA (Wald $\chi^2 = 7.785$; $p = 0.006$). The results also suggest that co-PA involving fathers increases the likelihood of co-PA occurring by 0.774. Enrolment in a special school led to a 0.395 increase in co-PA. Having a child with a diagnosis of autism spectrum disorder ($\beta = 0.875$), deafness/hard of hearing ($\beta = 1.439$), and Down's syndrome ($\beta = 1.555$) was associated with greater parental involvement in co-PA. However, parents of either sex who do not participate in PA/sports themselves ($\beta = -1.511$) or only do so 1–2 days a week ($\beta = -0.971$) or 3–4 days a week ($\beta = -0.644$) showed reduced involvement in co-PA. Parents of children aged 6 years old ($\beta = -0.643$), 7 ($\beta = -1.528$), or 9 years old ($\beta = -0.965$), those with children who do not belong to a sports club ($\beta = -1.186$), and children with only one sibling were less likely to engage in co-PA (see Table 6).

3.4. Logistic support

Table 7 illustrates the extent to which parents provide logistic support to their children with disabilities to enable them to engage in PA, categorized by the demographic variables investigated. The mean score for logistic support offered by parents to enable their disabled children to engage in PA was 2.31 ± 1.115 . This score falls within the expected cut-off values of 1.84 and 2.67, indicating that parents provide logistic support to enable their disabled children to engage in PA less than once a week.

Significant statistical differences were observed among participants based on various factors including parental educational background ($p = 0.005$), family income level ($p = 0.001$), parental involvement in PA/sports ($p = 0.001$), the age of the disabled child ($p = 0.001$), the child's specific type of disability ($p = 0.001$), the disabled child's membership of a sports club ($p = 0.001$), and the number of children in the family ($p = 0.001$; see Table 7). Pearson's χ^2 statistic divided by degrees of freedom increased from 0.677 in the full model to 0.725 in the reduced model, suggesting a satisfactory data fit. The level of logistic support provided by parents of children with disabilities to enable their offspring to engage in PA was significantly influenced by the age of the participants (Wald $\chi^2 = 11.516$; $p = 0.001$).

The findings also indicate that parents who have completed either a two-year or four-year college degree offer higher levels of logistic support to enable their children with disabilities to engage in PA. However, parents who do not engage in PA/sports themselves ($\beta = -1.356$) or who do so only 1–2 days a week ($\beta = -0.957$) or 3–4 days a week ($\beta = -0.67$) provided less logistic support for their children with disabilities to engage in PA. The level of parental logistic support for their children with disabilities to engage in PA decreased by 0.891 for families with incomes between \$20,000–\$34,999 per annum, and by 1.214 for families with incomes between \$35,000–\$49,999 per annum. Parents of children with disabilities aged 5 years old (with a coefficient of -0.469), 7 years old (with a coefficient of -0.890), and 9 years old (with a coefficient of -0.622), those with children with disabilities who are not part of a sports club (with a coefficient of -0.627), and those with children with disabilities with one sibling (with a coefficient of -0.836) and two siblings (with a coefficient of -1.001) were less likely to provide logistic support to enable their disabled children to engage in PA (see Table 8).

Table 6

Estimation of the model parameters relative to the co-physical activity between participants and their children with disabilities.

| Parameter | B | SE | 95 % Wald CI | | Wald χ^2 | Sig. |
|-----------------------------------------------------------------------------------|--------------------|--------|--------------|--------|---------------|-------|
| | | | Lower | Upper | | |
| (Intercept) | 7.800 | 0.9360 | 5.965 | 9.634 | 69.437 | 0.000 |
| [Relationship with child = Father] | 0.774 | 0.1362 | 0.507 | 1.041 | 32.307 | 0.000 |
| [Does the parent engage in physical activities or sports? = No] | -1.511 | 0.1793 | -1.863 | -1.160 | 71.053 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 1–2 days a week] | -0.971 | 0.1830 | -1.330 | -0.612 | 28.154 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 3–4 days a week] | -0.644 | 0.2361 | -1.106 | -0.181 | 7.434 | 0.006 |
| [Age of child with a disability = 6] | -0.643 | 0.2005 | -1.036 | -0.250 | 10.289 | 0.001 |
| [Age of child with a disability = 7] | -1.528 | 0.2024 | -1.925 | -1.131 | 56.981 | 0.000 |
| [Age of child with a disability = 9] | -0.965 | 0.1887 | -1.335 | -0.595 | 26.162 | 0.000 |
| [Child disability status = autism spectrum disorder] | 0.875 | 0.2545 | 0.376 | 1.374 | 11.813 | 0.001 |
| [Child disability status = Deaf/hard of hearing] | 1.439 | 0.3503 | 0.753 | 2.126 | 16.886 | 0.000 |
| [Child disability status = Down syndrome] | 1.555 | 0.2572 | 1.051 | 2.059 | 36.537 | 0.000 |
| [Does child with a disability join a sports club? = No] | -1.186 | 0.2400 | -1.656 | -0.715 | 24.401 | 0.000 |
| [How many children does the family have? = 2] | -1.086 | 0.2606 | -1.596 | -0.575 | 17.362 | 0.000 |
| [Does the child with a disability attend school? = Yes, special school] | 0.395 | 0.1596 | 0.082 | 0.708 | 6.132 | 0.013 |
| Age of parent | -0.090 | 0.0143 | -0.118 | -0.062 | 39.180 | 0.000 |
| (Scale) | 0.602 ^b | 0.0551 | 0.503 | 0.721 | | |

Note: β , beta; SE, standard error; Wald χ^2 , Wild chi-square.

Table 7
Parental logistic support provided to children with disabilities according to the demographic variables.

| | | N | Mean | SD | p | Model effects | | | | | |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------|------|------|-------|---------------|-------|-------|-------|--------|-------|
| | | | | | | Wald χ^2 | Sig. | | | | |
| (Intercept) | | | | | | 46.537 | 0.001 | | | | |
| Age of parent | | | | | | 11.516 | 0.001 | | | | |
| Relationship with child * | Father | 123 | 2.40 | 1.21 | 0.299 | 12.777 | 0.001 | | | | |
| | Mother | 116 | 2.19 | 1.00 | | | | | | | |
| Parental educational background | Elementary school | 19 | 2.08 | 0.89 | 0.005 | 27.167 | 0.001 | | | | |
| | Middle school | 20 | 2.63 | 1.60 | | | | | | | |
| | High school | 64 | 1.84 | 0.83 | | | | | | | |
| | College (2 years) | 18 | 2.15 | 0.56 | | | | | | | |
| | College (4 years) | 88 | 2.49 | 1.17 | | | | | | | |
| | Above college-level | 30 | 2.73 | 1.17 | | | | | | | |
| Does the parent hold a degree in special education? | No | 220 | 2.29 | 1.12 | 0.505 | 1.381 | 0.240 | | | | |
| | Yes | 19 | 2.43 | 1.13 | | | | | | | |
| Does the parent engage in physical activities or sports themselves? | No | 91 | 1.83 | 0.89 | 0.001 | 49.511 | 0.001 | | | | |
| | Yes, 1–2 days a week | 79 | 2.35 | 1.03 | | | | | | | |
| | Yes, 3–4 days a week | 31 | 2.51 | 1.31 | | | | | | | |
| | Yes, more than 4 days a week | 38 | 3.15 | 1.05 | | | | | | | |
| Family income (per annum) | Don't want to answer | 28 | 2.69 | 1.19 | 0.001 | 21.304 | 0.001 | | | | |
| | Less than \$20,000 | 77 | 2.20 | 1.16 | | | | | | | |
| | \$20,000 to \$34,999 | 64 | 1.82 | 0.80 | | | | | | | |
| | \$35,000 to \$49,999 | 36 | 2.47 | 0.99 | | | | | | | |
| | \$50,000 to \$74,999 | 27 | 2.75 | 1.24 | | | | | | | |
| | \$75,000 or more | 7 | 3.64 | 0.69 | | | | | | | |
| Age of child with a disability (years) | 5 | 29 | 1.96 | 0.59 | 0.001 | 45.018 | 0.001 | | | | |
| | 6 | 33 | 2.21 | 0.94 | | | | | | | |
| | 7 | 27 | 1.61 | 0.93 | | | | | | | |
| | 8 | 17 | 3.28 | 1.26 | | | | | | | |
| | 9 | 31 | 2.28 | 1.02 | | | | | | | |
| | 10 | 22 | 2.48 | 1.01 | | | | | | | |
| | 11 | 80 | 2.44 | 1.25 | | | | | | | |
| | Boy | 151 | 2.40 | 1.16 | | | | 0.109 | 0.060 | 0.806 | |
| | Girl | 88 | 2.13 | 1.02 | | | | | | | |
| | Child's disability status | Autism spectrum disorder | 72 | 2.70 | | | | 1.35 | 0.002 | 14.967 | 0.036 |
| Cerebral palsy | | 15 | 1.78 | 1.44 | | | | | | | |
| Visual/hearing impairment | | 10 | 2.43 | 0.79 | | | | | | | |
| Down syndrome | | 67 | 2.25 | 0.91 | | | | | | | |
| Learning disability | | 21 | 1.64 | 0.62 | | | | | | | |
| Mental disorder | | 14 | 2.14 | 0.77 | | | | | | | |
| Physical disability | | 25 | 2.38 | 0.78 | | | | | | | |
| Other | | 15 | 1.95 | 1.19 | | | | | | | |
| Does the child with a disability belong to a sports club? | | No | 223 | 2.24 | 1.12 | 0.001 | 8.376 | 0.004 | | | |
| | | Yes | 16 | 3.09 | 0.75 | | | | | | |
| Does the child with a disability attend school? | No | 41 | 2.48 | 1.23 | 0.118 | 6.450 | 0.092 | | | | |
| | Yes, private school | 16 | 2.41 | 0.70 | | | | | | | |
| | Yes, special school | 122 | 2.35 | 1.11 | | | | | | | |
| | Yes, public school | 60 | 2.05 | 1.10 | | | | | | | |
| Area of residence | Urban | 191 | 2.33 | 1.16 | 0.599 | 1.365 | 0.243 | | | | |
| | Rural | 48 | 2.16 | 0.91 | | | | | | | |
| Does the parent know about legislation or policies related to the rights of children with disabilities? | None | 42 | 1.94 | 1.30 | 0.001 | 5.062 | 0.281 | | | | |
| | Poor | 56 | 1.93 | 0.82 | | | | | | | |
| | Average | 75 | 2.35 | 1.07 | | | | | | | |
| | Good | 52 | 2.72 | 1.11 | | | | | | | |
| | Very good | 14 | 3.02 | 0.98 | | | | | | | |
| How many children does the family have? | 1 | 15 | 2.48 | 0.97 | 0.001 | 32.917 | 0.001 | | | | |
| | 2 | 41 | 2.30 | 1.44 | | | | | | | |
| | 3 | 33 | 2.01 | 0.75 | | | | | | | |
| | 4 | 42 | 2.23 | 0.89 | | | | | | | |
| | 5 | 55 | 2.87 | 1.18 | | | | | | | |
| | More than 5 | 53 | 1.89 | 0.92 | | | | | | | |
| | How many children with a disability are in the family? | One | 204 | 2.33 | | | | 1.11 | 0.205 | 0.173 | 0.677 |
| Two or more | | 35 | 2.11 | 1.17 | | | | | | | |

Note: SD, standard deviation; Wald χ^2 , Wild chi-square.

Table 8

Estimation of the model parameters related to parental logistic support for physical activity in children with disabilities.

| Parameter | B | SE | 95 % Wald CI | | | Sig. |
|-----------------------------------------------------------------------------------|------------------------------|------------------|-----------------|-----------------|---------------|-------|
| | | | Lower | Upper | Wald χ^2 | |
| (Intercept) | 6.480 | 0.7572 | 4.996 | 7.964 | 73.237 | 0.000 |
| [Educational background of parent = College (2 years)] | 0.713 | 0.3082 | 0.109 | 1.318 | 5.357 | 0.021 |
| [Educational background of parent = College (4 years)] | 0.609 | 0.2280 | 0.162 | 1.056 | 7.131 | 0.008 |
| [Does the parent engage in physical activities or sports? = No] | -1.356 | 0.1876 | -1.724 | -0.989 | 52.257 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 1–2 days a week] | -0.957 | 0.1984 | -1.346 | -0.568 | 23.262 | 0.000 |
| [Does the parent engage in physical activities or sports? = Yes, 3–4 days a week] | -0.670 | 0.2477 | -1.156 | -0.185 | 7.329 | 0.007 |
| [Family income (per annum) = \$20,000 to \$34,999] | -0.891 | 0.3661 | -1.608 | -0.173 | 5.917 | 0.015 |
| [Family income (per annum) = \$35,000 to \$49,999] | -1.214 | 0.3488 | -1.898 | -0.531 | 12.117 | 0.000 |
| [Age of child with a disability = 5] | -0.469 | 0.1952 | -0.852 | -0.086 | 5.770 | 0.016 |
| [Age of child with a disability = 7] | -0.890 | 0.1983 | -1.279 | -0.501 | 20.146 | 0.000 |
| [Age of child with a disability = 9] | -0.622 | 0.1964 | -1.007 | -0.237 | 10.035 | 0.002 |
| [Does the child with a disability belong to a sports club? = No] | -0.627 | 0.2501 | -1.117 | -0.137 | 6.292 | 0.012 |
| [How many children does the family have? = 2] | -0.836 | 0.2507 | -1.328 | -0.345 | 11.129 | 0.001 |
| [How many children does the family have? = 3] | -1.001 | 0.2553 | -1.501 | -0.500 | 15.363 | 0.000 |
| Age of parent (Scale) | -0.038 0.643 ^b | 0.0110 0.0588 | -0.059 0.538 | -0.016 0.770 | 11.711 | 0.001 |

Note: β , beta; SE, standard error; Wald χ^2 , Wild chi-square.

4. Discussion

Parental support was a significant predictor of PA in children with disabilities. The current study aimed to (i) measure parental support for PA in those with children with disabilities in Saudi Arabia, and (ii) examine the factors associated with parental support to enable their disabled children to engage in PA (family income level, age of the child, type of child's disability, and parental educational background).

Overall, the findings indicated that parental support to enable their disabled children to engage in PA typically occurs less than once a week, suggesting that there is inadequate parental support for children with disabilities to engage in PA among Saudi Arabian parents. This particular finding contradicts previous studies e.g., [38], which reported that parents in South Korea exhibited high levels of intention to provide support to enable their disabled children to engage in PA. Additionally, several independent variables, including participant age, educational background, parental engagement in PA, age of the child with a disability, disability status, club participation, knowledge of legislation or policies related to the rights of children with disabilities, and number of children in the family influenced overall parental support to enable their disabled children to engage in PA.

Regarding the subscales (*encouragement*, *co-PA*, and *logistic support*), the results of the current study illustrated that several independent variables were associated with all three subscales. These variables included parental engagement in PA, the age of the parents and the age of the child with a disability, the child's participation in a sports club, and the number of children in the family. In particular, the results indicated that parents who engage in PA themselves are more likely to provide support for their children with disabilities to engage in PA. This finding aligns with the logical assumption that parents tend to support their children to engage in activities that they themselves value. The finding is consistent with the parental role-modeling of PA hypothesis which proposes that children adopt PA behaviors by observing their parents' actions and engaging in PA alongside them [39]. This finding also aligns with the findings reported in Pitchford et al.'s [40] study that parental perceptions of the benefits of PA can influence their children's behaviors. In other words, if parents hold positive attitudes toward PA and believe PA to be important, they are more likely to encourage their children to participate in such activities. Beets et al. [17] presented evidence indicating that children without disabilities demonstrate a similar dependence on parental support for engaging in PA. A systematic review study demonstrated the significance of family preferences and activity orientation in relation to children's participation in activities [29]. However, parents should not merely be content with serving as role models for PA for their children; instead, they should also actively support their children's PA-related behaviors [16].

Furthermore, the current study's findings highlighted the influence of parents' and children's ages on parental support for their children's PA. Specifically, a direct relationship was observed between having a child aged 5 years old and parental support for PA; this may be because children at this age begin to exhibit a greater need for PA due to their developmental stage [41]. As a result, parents of children at this age may be more likely to provide support to help their children meet these developmental requirements. In America, for example, relevant organizations encourage parents to support their children with disabilities to engage in PA from early childhood onwards [42]. Greguol et al.'s [20] study revealed a significant and positive correlation between parental support and PA behaviors in younger children with disabilities; however, this association was not observed in older children with disabilities. This disparity could be attributed to the diminishing impact of parental influence on PA behaviors as children grow older [17].

Parental support is particularly crucial for younger children with disabilities as children tend to rely heavily on their parents to support their activities [43]. However, the current study's findings contrast with those of previous work which indicated that parents' and children's ages were *not* linked to engagement in PA by children with disabilities [31]. Moreover, the current study's results revealed a relationship between children with disabilities attending designated sports clubs and parental support for their children's participation in PA. This finding suggests that Saudi Arabian parents have a strong desire to support their children's participation in PA.

PA. As a result, they take the initiative to register their children in sports clubs specifically designed for those with disabilities. This finding concurs with that of Ku & Rhodes [16], who found that when parents incorporated PA behaviors (i.e., enrolling their children with disabilities in a designated sports club) into their daily routines, there was a greater likelihood of the children participating in PA. However, this outcome does not appear to be consistent across all parents. Columna et al. [28] found that although the parents of children with disabilities demonstrated a clear understanding of the benefits of PA and were committed to finding ways to motivate their children with disabilities to participate in PA to the best of their abilities, these efforts were not always successful.

Lastly, the current results indicate that the number of children in the family influences Saudi Arabian parental support for enabling their children with disabilities to participate in PA. This may be due to the increased responsibilities on parents caused by having to care for multiple children which can negatively impact their ability to provide adequate support. This finding was consistent with a recent study by Alghamdi and Alsaigh [31] which reported that higher levels of PA were observed in households with less than five members compared to households with five to ten individuals. The authors explained these findings by suggesting that parents in larger households may have limited time and support to assist their children with disabilities to participate in PA. This observation may also suggest that families caring for children with disabilities, particularly those who have additional responsibilities and may need additional assistance, face a shortage of suitable facilities and support [14].

Interestingly, parents in the current study with four children exhibited a high level of support for their children to engage in PA, especially in terms of providing encouragement. These observed differences can be explained by the fact that encouragement is often not directly tied to the practical assistance that parents need to provide, making it relatively easier for parents with a larger number of children to offer support in the form of encouraging their children with disabilities to engage in PA. Therefore, it appears that parental encouragement alone is insufficient to promote PA behaviors in Saudi Arabian children with disabilities. Thus, it may be the case that a comprehensive approach to providing parental support to enable children with disabilities to engage in PA is required in the Saudi Arabian context. This approach could usefully include various components like arranging transportation, monitoring the child's PA, engaging in co-PA, actively encouraging participation in PA, and providing appropriate equipment to facilitate participation in PA [16]. Parental monitoring of PA in children with disabilities is a behavior that regularly takes place to ensure their safety; conversely, this monitoring decreases in parental supervision of children without disabilities [25]. As a result, parents tend to exert more effort and dedicate more time to supporting their children with disabilities to engage in PA. However, further research is required to gain a more comprehensive understanding of the effect of the number of children in the family on this matter.

Furthermore, the findings demonstrated that other independent variables were associated with only two of the subscales. These variables included the parent-child relationship, parental educational background, family income level, and the child's disability status. Specifically, the results of the current study indicated that the sex of parents had an impact on the level of support and encouragement they provided to their children with disabilities in relation to participating in PA. In particular, fathers showed greater support than mothers. This finding may be expected, considering that PA and sports have not traditionally been widely embraced by women in Saudi Arabia for cultural and religious reasons [44].

Consequently, Saudi Arabian mothers of children with disabilities may fail to recognize the advantages of PA for their offspring, resulting in reduced support for their child's engagement in PA behaviors. This finding may also be attributed to the burdens experienced by parents in the Saudi context, particularly mothers, who have or care for a child with a disability. Research indicates that mothers of children with disabilities are at an increased risk of experiencing poor mental [45] and physical health [46]. This can be attributed to these parents' limited ability to effectively cope with the stressors associated with their child's special needs. Therefore, it is crucial to work on raising awareness among mothers regarding the importance of supporting their children in this regard and offer the correct support.

Additionally, the educational background of parents emerged as an important factor related to their support for enabling their children with disabilities to engage in PA. To explain, having a better educational background improves parents' knowledge and understanding of the importance of and how to encourage and involve their children with disabilities in PA. According to a systematic review by Columna et al. [30], one of the major challenges faced by parents of children with disabilities in promoting PA in their offspring is the lack of parental skills to engage their children in such activities. Aside from providing encouragement, Saudi Arabian parents with a middle school educational background provide a high level of support for their children with disabilities to participate in PA. Despite the disparities in the findings of the current study, Alghamdi and Alsaigh's [31] work demonstrated that the educational background of parents with children with disabilities has no impact on the levels of support they provide to enable their children to participate in PA.

Besides, family income level played a significant role in how much parental support is provided to enable children with disabilities to participate in PA. The results of the current study indicate that parents with a middle income provided more support compared to those on lower and higher incomes. However, it was surprising to note that parents with high incomes did not express strong support in relation to enabling their children with disabilities to participate in PA. This contradicts the results of Ku and Rhodes' [16] systematic review, namely, that families on higher incomes tend to offer greater support to their children with disabilities in terms of helping them to engage in PA compared to those on lower incomes. This can be attributed to various factors, e.g., the availability of domestic workers or nannies who assist in caring for children with disabilities in high-income families. As a result, these parents may perceive providing this type of support as less of a primary concern. In any case, numerous previous studies have demonstrated that financial issues and family income levels are among the most significant factors that impede parental support for children with disabilities to engage in PA [28].

Consequently, additional research and targeted programs are necessary to offer families strategies for overcoming such obstacles. These strategies should address the provision of low-cost PA and sports and specialized equipment required for children with disabilities. Lastly, the results of the current study indicate that the type of disability the child has is a factor influencing parental support

for their children to engage in PA. This finding is expected, as different disabilities have their own unique requirements. Therefore, some parents may find it easier to support their children with disabilities by providing transport to enable them to actively participate in PA while others may encounter difficulties and challenges in providing such support. For example, Columba et al. [28] identified that parents of children with visual impairments expressed a strong desire for their children to participate in PA; however, these visual impairments presented significant barriers to these children's involvement in PA. The parents also expressed concerns about their own ability to effectively guide and motivate their visually impaired children. These challenges extend to teaching and motivating their children to engage in PA. Consequently, there is a need to provide parents with relevant information about the characteristics of each disability type in terms of what kinds of PA are appropriate and its potential impact on participation.

Finally, the findings also showed that several independent variables were associated with only one of the subscales. These variables included knowledge of legislation or policies related to the rights of children with disabilities and the child's attendance at school. The results of the current study highlight that there is a relationship between parents' knowledge of policies and legislation related to the rights of children with disabilities and parental support for their children with disabilities to participate in PA.

This relationship is particularly evident in the *encouragement* subscale. Policies and legislation related to the rights of children with disabilities in Saudi Arabia emphasize the significance of providing support and encouragement in various forms for children with disabilities, especially regarding their involvement in PA. Consequently, this emphasis may be reflected in the parents' expressions of support for their children with disabilities to engage in PA. This result may be indicative of Saudi Arabian parents' desire for their children with disabilities to take part in PA, notwithstanding their concerns about their children's safety during such activities [25].

Moreover, the results of the current study also demonstrate a relationship between parental support for their children with disabilities to participate in PA and their children's attendance at school, particularly special schools. This support was specifically associated with co-PA. It is possible that this finding stems from the advice and recommendations provided by special schools to parents, which aim to promote PA levels among children with disabilities. Special schools often organize regular meetings for parents at which strategies to enhance their child's development across various domains, including participation in PA, are discussed.

Therefore, parental support in this particular respect may be a reflection of the discussions and guidance offered during these meetings. As indicated by a recent systematic review study [30], when developing interventions to promote PA among children with disabilities, professionals have highlighted the significant role of parental perceptions. To explain, if parents of children with disabilities have positive views of interventions or programs, they are more likely to actively participate in the recommended behaviors. Consequently, enhancing parental perceptions of PA can effectively support parents in motivating their children with disabilities to engage more actively in PA [30]. Moreover, a systematic review study by Ku and Rhodes [16] revealed that parental engagement in PA-related interventions positively impacted the PA behaviors of children with disabilities. The authors noted that two intervention studies [47,48] facilitated opportunities for parents and children to engage in co-PA during the program, allowing for the application of learned strategies and feedback from interventionists. These interventions prioritized educating parents about the importance of PA for their children and teaching strategies to help provide the necessary support and reinforcement. These findings emphasize the importance of involving both parents *and* children in interventions designed to effectively encourage behavior change like increasing children's participation in PA in natural settings, including the home, and incorporating PA into daily activities.

5. Limitations

While the present study has notable strengths, it is important to acknowledge its limitations so that they can be addressed in future research. First, the sample is likely to be unrepresentative of the overall population of Saudi Arabian parents with children who have disabilities. The sample was specifically drawn from parents residing in a single province of Saudi Arabia, namely the Eastern Province. However, it is worth noting that the Eastern Province is the largest and one of the most densely populated provinces in the country. Therefore, to capture a diverse sample, efforts were made to include participants from various regions within the Eastern Province. The second limitation pertains to the study's reliance on self-reported responses to the questionnaire. This means that the potential for recall bias and social desirability effects cannot be disregarded. Finally, although the questionnaire included an item that asked whether the child with a disability belongs to a sports club, it did not investigate the availability of clubs specifically catering to children with disabilities in the locality. Consequently, the parents may have desired to enroll their children in sports clubs but were unable to do so due to the absence of such clubs in their local area. Therefore, conducting future qualitative studies may be of significant importance to thoroughly and comprehensively examine the reasons that may hinder parental support for children with disabilities to engage in PA.

6. Practical applications

To enhance the design of programs intended to increase the participation of children with disabilities in PA, health promotion initiatives should recognize and leverage the distinct role parents play in the lives of children with disabilities in terms of effecting PA-related behavior change. Firstly, incorporating an educational component tailored for parents in both new and existing programs aimed at promoting PA among children with disabilities is essential. This educational component can provide parents with the necessary knowledge and skills to more effectively support their child's engagement in PA. In addition, such programs should offer ongoing support and guidance to parents on how to encourage and motivate their offspring to engage in PA. This could include providing resources such as informational materials, workshops, or online platforms where parents can access relevant resources and connect with other parents facing similar challenges. By offering continuous support, such programs can empower parents to provide the needed encouragement and assistance to increase their child's engagement in PA. Furthermore, addressing parents' beliefs and

attitudes toward their child's physical abilities is crucial. Programs should create a supportive environment that challenges the negative perceptions surrounding the participation of children with disabilities in PA and fosters positive attitudes towards their child's potential for engaging in PA. This can be achieved through providing workshops, counseling, or support groups where parents can share their experiences, receive encouragement, and learn from one another. By incorporating these additional support ideas, health promotion programs can effectively exploit the unique role parents play in promoting PA in children with disabilities in Saudi Arabia, leading to improved program outcomes and enhanced overall health and well-being for such children and their families.

7. Conclusions

The results of the current study identified that the frequency of parental support provided to enable children with disabilities to engage in PA in Saudi Arabia occurred less than once a week. This indicates that there is insufficient support for children with disabilities to engage in PA in Saudi Arabia. Additionally, the findings highlight the influence of various independent variables on overall parental support for facilitating engagement in PA among children with disabilities in Saudi Arabia. These variables include participant age, parental educational background, parental engagement in PA, age of the child with a disability, disability status, sports club participation, knowledge of legislation or policies related to the rights of children with disabilities, and number of children in the family. These findings emphasize the importance of raising parental awareness to encourage PA engagement among children with disabilities in Saudi Arabia and addressing the barriers that impede the provision of such support. Moreover, it is recommended that Saudi Arabian parents employ comprehensive strategies that encompass logistic support, co-PA, and encouragement to promote PA behaviors in their children with disabilities. This would involve proactive measures such as ensuring their child has access to suitable environments and adapted equipment for PA, engaging in co-PA to provide a good role model, as well as enrolling their child in sports programs and clubs for children with disabilities.

Funding statement

This research was funded by the Deanship of Scientific Research, King Faisal University, Saudi Arabia, grant number GRANT5,376.

Institutional review board statement

The study was approved by the Research Ethics Committee at King Faisal University, Saudi Arabia (KFU-REC-2023-JAN-ETHICS783).

Data availability statement

Data associated with the study has not been deposited into a publicly available repository. Data will be made available on request.

CRedit authorship contribution statement

Majed M. Alhumaid: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e29351>.

References

- [1] I. Bidzan-Bluma, M. Lipowska, Physical activity and cognitive functioning of children: a systematic review, *Int. J. Environ. Res. Publ. Health* 15 (4) (2018) 800, <https://doi.org/10.3390/ijerph15040800>.
- [2] I. Janssen, A.G. LeBlanc, Systematic review of the health benefits of physical activity and fitness in school-aged children and youth, *Int. J. Behav. Nutr. Phys. Activ.* 7 (1) (2010) 1–16, <https://doi.org/10.1186/1479-5868-7-40>.
- [3] M. Rodríguez-Ayllon, C. Cadenas-Sánchez, F. Estévez-López, N.E. Muñoz, J. Mora-Gonzalez, J.H. Migueles, I. Esteban-Cornejo, Role of physical activity and sedentary behavior in the mental health of preschoolers, children and adolescents: a systematic review and meta-analysis, *Sports Med.* 49 (9) (2019) 1383–1410, <https://doi.org/10.1007/s40279-019-01099-5>.
- [4] R. Guthold, G.A. Stevens, L.M. Riley, F.C. Bull, Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants, *The Lancet Child & Adolescent Health* 4 (1) (2020) 23–35, [https://doi.org/10.1016/S2352-4642\(19\)30323-2](https://doi.org/10.1016/S2352-4642(19)30323-2).

- [5] P.T. Katzmarzyk, K.D. Denstel, K. Beals, C. Bolling, C. Wright, S.E. Crouter, S.B. Sisson, Results from the United States of America's 2016 report card on physical activity for children and youth, *J. Phys. Activ. Health* 13 (s2) (2016) S307–S313, <https://doi.org/10.1123/jpah.2016-0321>.
- [6] L. Price, K. Wyatt, J. Lloyd, C. Abraham, S. Creanor, S. Dean, M. Hillsdon, Are we overestimating physical activity prevalence in children? *J. Phys. Activ. Health* 15 (12) (2018) 941–945, <https://doi.org/10.1123/jpah.2018-0030>.
- [7] R.J. Shephard, Physiological, biochemical, and psychological responses to exercise and physical activity, in: R.J. Shephard, H.S. Miller Jr (Eds.), *Exercise and Heart in Health and Disease*, Dekker, 1999, pp. 1–58.
- [8] M.J. Babic, P.J. Morgan, R.C. Plotnikoff, C. Lonsdale, R.L. White, D.R. Lubans, Physical activity and physical self-concept in youth: systematic review and meta-analysis, *Sports Med.* 44 (2014) 1589–1601, <https://doi.org/10.1007/s40279-014-0229-z>.
- [9] J.M. Satchek, J.F. Kuder, C.D. Economos, Physical fitness, adiposity, and metabolic risk factors in young college students, *Med. Sci. Sports Exerc.* 42 (6) (2010) 1039–1044, <https://doi.org/10.1249/mss.0b013e3181c9216b>.
- [10] H. Taanila, A.J. Hemminki, J.H. Suni, H. Pihlajamäki, J. Parkkari, Low physical fitness is a strong predictor of health problems among young men: a follow-up study of 1411 male conscripts, *BMC Publ. Health* 11 (2011) 1–14, <https://doi.org/10.1186/1471-2458-11-590>.
- [11] F.C. Bull, S.S. Al-Ansari, S. Biddle, K. Borodulin, M.P. Buman, G. Cardon, J.F. Willumsen, World Health Organization 2020 guidelines on physical activity and sedentary behaviour, *Br. J. Sports Med.* 54 (24) (2020) 1451–1462, <https://doi.org/10.1136/bjsports-2020-102955>.
- [12] G.C. Frey, H.I. Stanish, V.A. Temple, Physical activity of youth with intellectual disability: review and research agenda, *Adapt. Phys. Act. Q. (APAQ)* 25 (2) (2008) 95–117, <https://doi.org/10.1123/apaq.25.2.95>.
- [13] J. Jung, W. Leung, B.M. Schram, J. Yun, Meta-analysis of physical activity levels in youth with and without disabilities, *Adapt. Phys. Act. Q. (APAQ)* 35 (4) (2018) 381–402, <https://doi.org/10.1123/apaq.2017-0123>.
- [14] N. Shields, A.J. Synnot, M. Barr, Perceived barriers and facilitators to physical activity for children with disability: a systematic review, *Br. J. Sports Med.* 46 (14) (2012) 989–997, <https://doi.org/10.1136/bjsports-2011-090236>.
- [15] J.E. Donnelly, C.H. Hillman, D. Castelli, J.L. Etnier, S. Lee, P. Tomporowski, A.N. Szabo-Reed, Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review, *Med. Sci. Sports Exerc.* 48 (6) (2016) 1197, <https://doi.org/10.1249/MSS.0000000000000901>.
- [16] B. Ku, R.E. Rhodes, Physical activity behaviors in parents of children with disabilities: a systematic review, *Res. Dev. Disabil.* 107 (2020) 103787, <https://doi.org/10.1016/j.ridd.2020.103787>.
- [17] M.W. Beets, B.J. Cardinal, B.L. Alderman, Parental social support and the physical activity-related behaviors of youth: a review, *Health Educ. Behav.* 37 (5) (2010) 621–644, <https://doi.org/10.1177/1090198110363884>.
- [18] S.C. Dumith, D.P. Gigante, M.R. Domingues, P.C. Hallal, A.M. Menezes, H.W. Kohl, Predictors of physical activity change during adolescence: a 3- 5-year follow-up, *Publ. Health Nutr.* 15 (12) (2012) 2237–2245, <https://doi.org/10.1017/S1368980012000948>.
- [19] P.D. Loprinzi, D.P. Schary, M.W. Beets, J. Leary, B.J. Cardinal, Association between hypothesized parental influences and preschool children's physical activity behavior, *Am. J. Health Educ.* 44 (1) (2013) 9–18, <https://doi.org/10.1080/19325037.2012.749685>.
- [20] M. Greguol, E. Gobbi, A. Carraro, Physical activity practice among children and adolescents with visual impairment—influence of parental support and perceived barriers, *Disabil. Rehabil.* 37 (4) (2015) 327–330, <https://doi.org/10.3109/09638288.2014.918194>.
- [21] D.B. Maltais, F. Dumas, N. Boucher, C.L. Richards, Factors related to physical activity in adults with cerebral palsy may differ for walkers and nonwalkers, *American journal of physical medicine & rehabilitation* 89 (7) (2010) 584–597, <https://doi.org/10.1097/PHM.0b013e3181d89f32>.
- [22] N. Shields, A. Synnot, Perceived barriers and facilitators to participation in physical activity for children with disability: a qualitative study, *BMC Pediatr.* 16 (1) (2016) 1–10, <https://doi.org/10.1186/s12887-016-0544-7>.
- [23] K.D. Lakes, M.M. Abdullah, J. Yousef, J.H. Donnelly, C. Taylor-Lucas, W.A. Goldberg, S. Radom-Aizik, Assessing parent perceptions of physical activity in families of toddlers with neurodevelopmental disorders: the parent perceptions of physical activity scale (PPPAS), *Pediatr. Exerc. Sci.* 29 (3) (2017) 396–407, <https://doi.org/10.1123/pes.2016-0213>.
- [24] A.M. McGarty, S.C. Westrop, C.A. Melville, Exploring parents' experiences of promoting physical activity for their child with intellectual disabilities, *J. Appl. Res. Intellect. Disabil.* 34 (1) (2021) 140–148, <https://doi.org/10.1111/jar.12793>.
- [25] E.A. Siebert, J. Hamm, J. Yun, Parental influence on physical activity of children with disabilities, *Int. J. Disabil. Dev. Educ.* 64 (4) (2017) 378–390, <https://doi.org/10.1080/1034912X.2016.1245412>.
- [26] B. Ku, S. Healy, J. Yun, Development of a survey measuring parental physical activity support in parents of children with disabilities, *Disabil. Rehabil.* 45 (16) (2022) 2660–2667, <https://doi.org/10.1080/09638288.2022.2089921>.
- [27] P.D. Loprinzi, B.J. Cardinal, K.L. Loprinzi, H. Lee, Benefits and environmental determinants of physical activity in children and adolescents, *Obes. Facts* 5 (4) (2012) 597–610, <https://doi.org/10.1159/000342684>.
- [28] L. Columna, S. Rocco Dillon, M.L. Norris, M. Dolphin, L. McCabe, Parents' perceptions of physical activity experiences for their families and children with visual impairments, *Br. J. Vis. Impair.* 35 (2) (2017) 88–102, <https://doi.org/10.1177/0264619617691081>.
- [29] S. Arakelyan, D. Mavicer, R. Rush, A. O'hare, K. Forsyth, Family factors associated with participation of children with disabilities: a systematic review, *Dev. Med. Child Neurol.* 61 (5) (2019) 514–522, <https://doi.org/10.1111/dmcn.14133>.
- [30] L. Columna, L. Prieto, G. Elias-Revollo, J.A. Haeghele, The perspectives of parents of youth with disabilities toward physical activity: a systematic review, *Disability and health journal* 13 (2) (2020) 100851, <https://doi.org/10.1016/j.dhjo.2019.100851>.
- [31] S. Alghamdi, R. Alsaigh, Determinants of physical activity among children with disabilities, *Healthcare* 11 (4) (2023, February) 494, <https://doi.org/10.3390/healthcare11040494>.
- [32] A.A. Alhusaini, M. Ali Al-Walal, G.R. Melam, S. Buragadda, Pedometer-determined physical activity levels of healthy children and children with Down's syndrome, *Somatosen. Mot. Res.* 34 (4) (2017) 219–225, <https://doi.org/10.1080/08990220.2017.1415880>.
- [33] R.M. Alwhaibi, H.M. Aldugahishem, Factors affecting participation in physical activities in Saudi children with Down syndrome: mothers' perspectives, *Disabil. Rehabil.* 41 (13) (2019) 1524–1535, <https://doi.org/10.1080/09638288.2018.1433241>.
- [34] S. Alghamdi, M. Banakhar, H. Badr, S. Alsulami, Physical activity among children with down syndrome: maternal perception, *Int. J. Qual. Stud. Health Well-Being* 16 (1) (2021) 1932701, <https://doi.org/10.1080/17482631.2021.1932701>.
- [35] V.D. Sousa, W. Rojjanasrirat, Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline, *J. Eval. Clin. Pract.* 17 (2) (2011) 268–274, <https://doi.org/10.1111/j.1365-2753.2010.01434.x>.
- [36] F. Faul, E. Erdfelder, A. Buchner, A.G. Lang, Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses, *Behav. Res. Methods* 41 (2009) 1149–1160, <https://doi.org/10.3758/BRM.41.4.1149>.
- [37] M.S.B. Yusoff, ABC of content validation and content validity index calculation, *Education in Medicine Journal* 11 (2) (2019) 49–54.
- [38] M. Jeong, S.-Y. Kim, E. Lee, Parents' beliefs and intentions toward supporting physical activity participation for their children with disabilities, *Adapt. Phys. Act. Q. (APAQ)* 32 (2) (2019) 93–105, <https://doi.org/10.1123/APAQ.2013-0106>.
- [39] C.A. Yao, R.E. Rhodes, Parental correlates in child and adolescent physical activity: a meta-analysis, *Int. J. Behav. Nutr. Phys. Activ.* 12 (2015) 10, <https://doi.org/10.1186/s12966-015-0163-y>.
- [40] E.A. Pitchford, E. Siebert, J. Hamm, J. Yun, Parental perceptions of physical activity benefits for youth with developmental disabilities, *Am. J. Intellect. Dev. Disabil.* 121 (1) (2016) 25–32, <https://doi.org/10.1352/1944-7558-121.1.25>.
- [41] Physical and cognitive development in early childhood. (n.d.). https://edge.sagepub.com/sites/default/files/07_KUTHER.pdf.
- [42] Centers for Disease Control and Prevention [CDC], Physical activity and health. <http://www.cdc.gov/physicalactivity/basics/pa-health/index.htm>, 2015.
- [43] B. Ku, M. MacDonald, B. Hatfield, K.B. Gunter, Parental influences on parent-reported motor skills in young children with developmental disabilities, *Disability and Health Journal* 13 (3) (2020) 100910, <https://doi.org/10.1016/j.dhjo.2020.100910>.
- [44] H.M. Al-Hazzaa, Physical inactivity in Saudi Arabia revisited: a systematic review of inactivity prevalence and perceived barriers to active living, *Int. J. Health Sci.* 12 (6) (2018) 50–64.

- [45] A. Majnemer, M. Shevell, M. Law, C. Poulin, P. Rosenbaum, Indicators of distress in families of children with cerebral palsy, *Disabil. Rehabil.* 34 (14) (2012) 1202–1207, <https://doi.org/10.3109/09638288.2011.638035>.
- [46] L.M. Lach, D.E. Kohen, R.E. Garner, J.C. Brehaut, A.R. Miller, A.F. Klassen, P.L. Rosenbaum, The health and psychosocial functioning of caregivers of children with neurodevelopmental disorders, *Disabil. Rehabil.* 31 (9) (2009) 741–752, <https://doi.org/10.1080/08916930802354948>.
- [47] B.E. Matheson, A. Drahota, K.N. Boutelle, A pilot study investigating the feasibility and acceptability of a parent-only behavioral weight-loss treatment for children with autism spectrum disorder, *J. Autism Dev. Disord.* 49 (2019) 4488–4497, <https://doi.org/10.1007/s10803-019-04178-8>.
- [48] C. Willis, A. Nyquist, R. Jahnsen, C. Elliott, A. Ullenhag, Enabling physical activity participation for children and youth with disabilities following a goal-directed, family-centred intervention, *Res. Dev. Disabil.* 77 (2018) 30–39, <https://doi.org/10.1016/j.ridd.2018.03.010>.