



Physical Activity and Quality of Life in Youth with Visual Impairments: A Scoping Review



Pamela Beach*, Sarvin Salar, Jessica Sniatecki, Kelsey Zehr, Lauren Lieberman

SUNY Brockport University, USA

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*Corresponding author: Pamela Beach, SUNY Brockport University, 350 New Campus Dr. Brockport, NY 14420, USA, Email: pbeach@brockport.edu

Abstract

Physical activity is linked to health-related physical and psychological benefits contributing to improved quality-of-life (QoL) across the lifespan. While individuals with visual impairments (VI) face additional barriers to living a physically active lifestyle, youth with VI also likely benefit from a physically active lifestyle. The present scoping review examined the literature on physical activity and QoL in youth with VI to identify the gaps in the literature and inform future methodologies on QoL and physical activity in the population. The search included a screening of 5,162 articles which yielded seven articles to be included in the analyses using keywords related to youth with VI, physical activity and QoL indicators. The themes of the results include, (1) the type of well-being, (2) QoL indicators and measures, and (3) outcomes of the research on physical activity and QoL. With so few articles on this topic, this scoping review revealed that the existing literature is limited both in its scope and its generalizability due to the paucity and inconsistency of studies in this area. Specifically, more work is needed to identify physical activity programming that is inclusive for youth with VI and to examine the specific factors that impact participation and motivation.

Keywords: Visual impairments; Physical activity; Lifestyle behavior; Mental health

Introduction

Physical activity is a modifiable lifestyle behavior that has been linked to a variety of physiological and psychological benefits in the general population [1]. The World Health Organization (WHO) states that to maintain good health, children and adolescents should achieve 60 minutes of moderate to vigorous physical activity on each day of the week and keep sedentary time to a minimum [2]. Though the benefits of a physically active lifestyle are well-known, some research has indicated that youth and adults with visual impairments (VI) engage in more sedentary behaviors than physical activity during their leisure time [3], are less likely to meet physical activity guidelines [4], and take fewer steps per day compared to sighted [5].

Low vision may be a key barrier to a physically active lifestyle in adults and adolescents. In a sample of 6,634 participants with VI from the United Kingdom, participants with VI were twice as likely to be physically inactive than those who were sighted [6]. Williams and colleagues (2018) [7], found associations between VI in both eyes were associated with less daily moderate-to-vigorous physical activity and fewer steps [7]. Another study

among students with VI found that participants engaged less in physical activity than partially-sighted students aged 15 to 22 years, with male students reporting more physical activity than female students and young adults reporting more total physical activity than the adolescents [8]. Overall, 39.3% of participants did not meet the recommendation of 75 min/week of vigorous physical activity, and 23.8% did not meet the recommendation of almost 150 min/week of moderate physical activity. In total, 32.8% of participants did not meet the international recommendations of 420 min/week moderate or vigorous physical activity.

Physical activity and sedentary behaviors can impact health-related quality of life (HRQoL) for adults with VI [9]. Individuals who have more severe VI tend to report lower HRQoL scores than those with mild or moderate VI [10]. Physical activity in adults with VI is positively associated with HRQoL [9,11]. Lower HRQoL among people with VI, particularly those with more severe VI, can result in lower self-rated health, decreased physical and emotional functioning, and lower rates of socialization [12]. Higher anxiety was also a predictor of reduced physical activity and sedentary behavior in Chinese children with low vision [13].

Conversely, individuals with VI who were highly physically active gained psychological benefits including significantly higher life satisfaction in leisure situations than their less physically active peers [14] and increased self-efficacy [15]. Self-efficacy is positively associated with physical activity behaviors of adults with VI and as a direct and indirect influencer of HRQoL. Haegele et al. [9], demonstrated that physical activity significantly predicted HRQoL.

In a systematic review, Caputo and colleagues (2022) [16] found significant relationships between physical activity and several quality of life (QoL) outcomes for individuals with VI, including a variety of measures related to QoL, life satisfaction, health status, and psychological health [16]. Three additional studies identified in the review did not find significant relationships between physical activity and QoL for individuals with VI [16]. While this review substantiates the benefits of physical activity upon QoL with individuals with VI, the studies were focused upon adults.

Children and adolescents with VI may also experience more emotional problems than their sighted peers. For example, the prevalence of depression, fear and anxiety and psychiatric disorders among children with VI was higher than these behaviors among their sighted peers [17]. Severity of VI might also increase the mood disorders and sense of loneliness and fear experienced by children with VI. Young people with VI may have fewer opportunities to make friends and may face problems of social isolation and, consequently, they may develop emotional and communication problems [18]. As a result, previous authors have suggested that early physical activity intervention in youth with sensory impairments is critical for optimal social, emotional, and physiological development across the lifespan [19].

Unmistakably, sport and recreational programs serve as natural outlets for promoting physical activity participation and enhancing social skills [20]. Yet, children and adolescents with sensory impairments experience unique barriers to participation in exercise-based programs [4]. This makes access to health-promoting levels of physical activity even more challenging, due to lack of opportunities (physical activity programs adapted to specific needs), safety, motivation, trained professionals, human guides, and equipment [21], lack of appropriate physical activity programs [22], and staff capacity [23]. Haegele and Porretta [24], stated that low physical activity levels of school children with VI may be connected with perceived participation barriers such as the availability of appropriate opportunities. Lack of social interaction is also associated with a risk of exclusion [4]. Pinquart and Pfeiffer [25], reported that parents and teachers played important roles in identifying and minimizing possible mental health problems among children with VI. However, insufficient knowledge among instructors on how to adapt lessons and use modified equipment has been linked to reduced opportunities

for participation in physical activity among children with VI [26]. Despite these barriers, youth with sensory impairments can decrease some of their barriers to physical activity by participating in a school-based running programs [27].

As noted in several of the aforementioned studies, the relationship between physical activity and mental health among youth with VI remains largely unexplored. Because of the dearth of research in this arena, and to further examine these relationships, the purpose of this study was to conduct a scoping review on the existing research on the effects of physical activity on mental health and QoL in youth with VI. An additional specific aim of this scoping review was to examine the availability of interventions for this population, guided by the following questions: (1) What QoL measures are improved by physical activity in youth with VI? (2) What are the gaps in existing research on physical activity and QoL for this population?

Methods

Study objectives

The objectives of this study were to: (a) summarize the effects of physical activity upon QoL and related barriers and adverse events experienced by youth with VI; and (b) identify physical activity interventions that have been proposed, implemented, or evaluated in community settings with possible benefits related to mental health, QoL and related outcomes (e.g. health, stress, burden, and barriers) experienced by youth with VI.

Guiding framework

The present scoping review was conducted to examine the body of research on physical activity and mental health in youth with VI, identify gaps and inform future methodologies on the topic. The Arsey and O'Malley (2005) five stage scoping review approach was followed, including Stage One: identifying the research question; Stage Two: identifying relevant studies; Stage Three: study/ article selection; and Stage Four: charting the data.

Stage One: Identifying the Research Question

The authors used the PICO (Population, Intervention, Context, Analysis) method to guide development of the research questions for this scoping review (da Costa et al., 2007; See Table 1). The research questions for this scoping review include:

- (1) what types of physical activity benefit mental health and QoL in youth with VI?
- (2) What other factors in physical activity programs are important to improve mental health and QoL in youth with VI?
- (3) What are the gaps in existing research on physical activity and mental health for this population?

Table 1: PICO analysis for development of the research question.

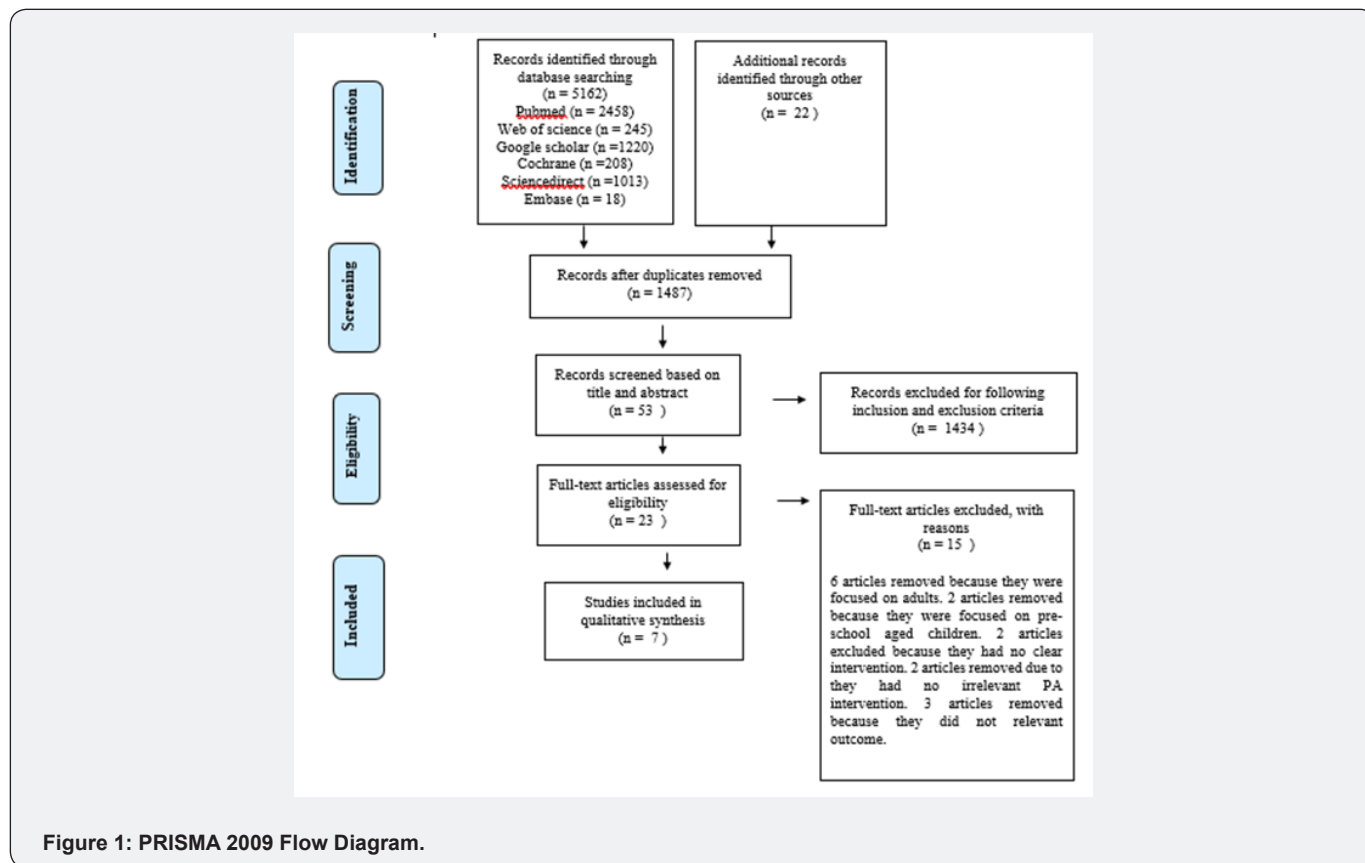
PICO Headings	Description
P Population/participants	Youth with VI
I Intervention	Any physical activity interventions developed, implemented, and evaluated to address issues related to QoL including mental health (e.g. depression, stress, and anxiety among youth with VI
C Context	School or Community setting; studies published in the English language; study designs eligible (i.e., quantitative, qualitative, etc.) studies; published within the last 10 years
O Outcome	QoL, mental health, depression, stress, barriers

Stage 2: Identifying Relevant Studies/Articles

The research team, in consultation with an experienced librarian, designed the scoping review search strategy. The search consisted of peer-reviewed articles available in PubMed, Web of Science, Google Scholar, Cochrane, ScienceDirect, and Embase, which were customized for each database. Studies which examined physical activity and mental health and QoL in youth with VI were obtained. The team was particularly interested in research on QoL indicators in youth with VI, including mental health, stress, anxiety, and depression. Additionally, the team sought interventions which involved physical activity to address QoL outcomes including interventions through schools or communities. All study designs were eligible for inclusion in this scoping review but must have been published in the English

language and were published within ten years.

Once the search was conducted, manuscript citations from each database were uploaded to a web-based program (RAYYAN) (Ouzzani et al., 2016) where the duplicates were identified and then removed. Then, the title and abstract of each citation were analyzed by two reviewers, and then, through the Ancestry Method, the reference list of included articles was individually searched for possible additional studies. Grey literature was identified by conducting internet searches and asking experts in VI and physical activity to aid identifying other relevant publications. Figure 1 presents our PRISMA flow diagram with the data charting process for this scoping review study in a chronological manner (Tricco et al., 2018).



Stage 3: Study/Article Selection

Two reviewers conducted the full screening including the titles, abstracts, and full-text citations. Discussions ensued to reach consensus following any disagreements. The population of interest included youth with VI (children or adolescents under 20 years). Research articles were included which met these inclusion criteria:

- Published between 2013-2023
- Studies were limited to publications in the English language.
- Studies examined outcomes related to QoL including mental health, stress, depression, or anxiety.
- Studies which proposed, implemented, or evaluated physical activity interventions to address QoL indicators in youth with VI.

Stage 4: Charting the data

Two members of the research team completed independent evaluations to assess the inherent risk of bias in the studies included in the scoping review. Studies were reviewed to determine if bias was present in the randomization process, data collection processes, outcome measures, and/or reported results. Additionally, each study was closely examined to determine if there were any deviations from the planned interventions or study protocols that may have impacted results.

Results

Seven studies were included in the analyses from the 5,162 articles screened. See the Prisma chart, Figure 1. Characteristics of the studies were extracted from each of the seven studies that reached the full-text screening process, which included youth with VI, physical activity interventions, and QoL indicators. Table 2 includes pertinent data extracted from each study including the first author's name, publication year, characteristics of the youth with VI, study concept, methodology, and aims/ objectives. Table 3 includes the barriers to QoL and adverse events.

Risk of bias

Overall, bias assessment risk was rated "low" for most of the included studies with two studies identified as having "some concerns" for risk of bias. The largest source of bias in these studies stems from the lack of random selection or assignment of study participants. Since having a VI is a primary characteristic of interest, and thus required for participation, random selection and assignment are not viable options. Thus, researchers must rely on recruitment methods that target the population of interest, typically convenience sampling. In many of the studies reviewed, researchers used siblings or groups of students without VI as the comparison group. Elevated risk of bias ("some concerns") was noted in studies that did not include a comparison group

to help contextualize results - Harris & Lord, 2016; Mueller & Ackley-Holbrook, 2016; and Scally & Lord, 2019. An additional concern was noted by one of the reviewers for Mueller & Ackley-Holbrook, 2016 due to the small sample size ($n = 11$) which limits generalizability of results.

Study characteristics

The analyzed articles included 586 youth with VI and 18,285 youth without VI. This disproportionate number of controls was largely due to Harris and Lord's (2016) study which included 10,436 parent reports and 6,328 teacher reports in comparison to only 189 parent reports and 138 teacher reports with youth with VI. Characteristics assessed included gender, severity of VI, and age.

Severity of VI

Most of the studies in this scoping review examined the level of VI, but only two assessed the severity of VI as a dependent factor [28,29]. Neither of these studies revealed an association between VI and physical activity or well-being scores. Brunes and colleagues' (2015)[28], results indicated that participants who self-reported no impairment (SRNI) and those who self-reported visual impairment (SRVI) had no significant differences between well-being scores (including symptoms of anxiety and depression) and physical activity, with authors noting a statistically insignificant association in the SRVI mental health scale with physical activity. However, for participants with SRVI who had higher levels of intraversion or emotional instability at baseline, physical activity was significantly associated with improved mental health outcomes [28]. Giese and colleagues (2017) [29], suggested that the lack of association with levels of VI and physical activity participation may be connected with the environment, including opportunities for activity and a curriculum designed around high expectations at the school for the blind.

The following sections will cover the significant findings from the articles reviewed. More specifically, (1) the type of well-being, (2) QoL indicators and measures, and (3) outcomes.

Type of well-being

The studies in this scoping review included a variety of types of well-being including: emotional, physiological, and physical. Brunes et al. [28] and Giese et al. [28] used the emotional well-being WHO-5 scale to examine both emotional and physical well-being including muscular strength, composition, and overall health. Commonly used measures included self-reported questionnaires, interviews (focus groups), and surveys due to the large sample sizes. Haegele and colleagues [15] and Harris and Lord (2016) examined well-being using the Strengths and Difficulties Questionnaire (SDQ). The SDQ was examined in association with factors associated with body composition, physical activity participation, and nutrition [15], while Harris and Lord (2016) assessed risk of psychiatric disturbances

through parental and teacher responses. Scully and Lord (2019) developed their own parent survey related to the physical activity of their child with face validity. Mueller and Ackley-Holbrook [27], focused on the influence of environmental factors on individual

perception by using two instruments, Physical Activity Barriers Questionnaire for the Blind or Visually Impaired and the Self-Efficacy for Exercise Questionnaire.

Table 2: Characteristics of each study.

Definition of Visual impairment	Characteristics of the youth with VI (experimental group)	Characteristics of the control group	Study context/ concept	Study methodology	Study aims/objectives
<p>1. Factors associated with higher risks of lifestyle-related disorders either start or intensify in this life stage, and the way that adolescents handle the challenges may impact health-related outcomes later in life, in this case, mental health.</p> <p>2. Between vision status and mental health, studies have found that adolescents with visual impairment have reported a lower quality of life compared with sighted adolescents.</p> <p>3. Physical activity (PA) levels of children and adolescents with visual impairment are evidently lower.</p>	<p>46 youth with VI</p>	<p>1371 adolescents without VI completed the same self-reported survey as the experimental group.</p>	<p>The purpose was to study the effect of physical activity (PA) on mental health according to self-reported vision categories among adolescents. The study was conducted in Nord-Trøndelag, Norway, during the period 1995–1997, with a follow-up 4 years later. Self-reported measurements were used to assess PA and vision at baseline, and mental health problems and well-being at follow-up.</p>	<p>Various “self-administered” questionnaires for adolescents were used in this study: 1. Self-reported measures = low costs, being less prone to oversimplification of vision status, and providing a more complete understanding of an individual’s interpretation of visual abilities. In the study, the presence and severity of visual impairment were assessed at baseline by a single question: “How would you describe your visual impairment?” The question had four response alternatives: “no,” “a little,” “somewhat,” and “severely.” 2. Data and sample collection = of a prospective population-based health study carried out in Central Norway, namely, the Nord-Trøndelag Health Study, used the Young-HUNT Study. In two waves, using the same kids (1995 to 2001), the took the same survey. 3. In Young-HUNT 1 and 2, days and hours of moderate to high intensity of weekly leisure time PA were measured. The questions in this survey were derived from the World Health Organization’s Health Behavior in School-aged Children (WHO HBSC) study which was based on an 8 point scale. 4. In the study, the mental illness dimension of mental health was assessed using the Hopkins Symptom Checklist (SCL) in an attempt to measure depression and anxiety.</p>	<p>The purpose of the study was to examine the effect of physical activity (PA) on mental health according to self-reported vision categories among adolescents. Additionally, to investigate the impact of leisure-time PA on symptoms of mental health problems and subjective well-being (SWB among adolescents with self-reported no impairment (SRNI) and self-reported visual impairment (SRVI).</p>

<p>A child's level of disability (e.g., level of vision) influences her or his level of PA participation. Moreover, children with VI are impacted by the availability (or lack) of PA opportunities. Consequently, these children are more sedentary than their peers without disabilities.</p>	<p>10 youth with visual impairments 1. Level of VI = there were many parents who reported the severity of VI, including Oculocutaneous Abinism, Blind, Legally blind, Albinism, Left hemianopia, Degenerative myopia, Coloboma, Nystagmus, optic Nerve hypoplasia. 2. Additional Disabilities = which included ADHD, Hydrocephalus, Autism, ODD/CP, ID, Asthma, Kidney problems, AS, and Hypersensitivity. 3. The age range of the kids was 4 to 12 years.</p>	<p>Characteristics of the Parents: 1. Age of the mothers and fathers were recorded = Mother's range 29 to 52 years and Father's range 31 to 62 years. 2. The main categories that the parents were placed in was based on their commitment, challenges they faced with VI, and access to PA support.</p>	<p>Physical activity (PA) provides multiple benefits to children with visual impairments (VI) and their families. However, the empirical literature base is underdeveloped on how family PA experiences impact participation for children with VI.</p>	<p>The research method was descriptive - qualitative positioned in the theoretical framework of the theory of planned behavior. Participants were parents of children with VI who took part in one-on-one semi-structured telephone interviews. Interview recordings were transcribed and analyzed using a thematic line-by-line analysis.</p>	<p>The purpose of this study was two-fold; that is: (a) to explore why families with children with VI seek out and participate in PA, and (b) to describe the strategies and supports needed by families of children with VI to improve PA participation. It is mentioned: "Given that parental involvement is critical to the active participation of children with disabilities in the community, measures must be taken to ensure parents have the skills to promote, encourage, and teach their children to lead physically active lifestyles. Moreover, research is needed to explore the experiences, motives, attitudes, and barriers to PA of families of children with disabilities. This information is important to not only maximize recreational opportunities for these families, but to enhance their quality of life."</p>
<p>VI is defined as a visual acuity of 0.3 or less in the better eye with best possible correction. In German law, severe VI is defined as a visual acuity of 0.05 or less in the better eye with best possible correction. Blindness is defined as best corrected visual acuity of 0.02 or less in the better eye or a visual field restriction to no more than the central 5°. "Research in Germany on individuals who are visually impaired or blind is limited and is concerned mostly with educational and didactic aspects and ophthalmology. Because of reduced physical activity patterns, children and youths with VI tend to have lower levels of health-related physical fitness and poorer body composition values compared to sighted children."</p>	<p># of youth with VI = 115 (67 male and 48 female)</p>	<p># of controls = 118 (63 male and 55 female)</p>	<p>The study compares levels of physical activity, body composition values, and emotional well-being of school-age children and youths with visual impairments in specialized schools with those of sighted children in mainstream schools. The results confirm the positive effects and the importance of physical activity for students with visual impairments. High levels of physical activity are possible which provide health-related benefits for children and youths with visual impairments.</p>	<p>The methodology included various analytical instruments. Including pedometers, bioelectrical impedance analysis, and the WHO-Five Well-being Index.</p>	<p>1. The purpose of this study was to investigate (1) physical activity, (2) body composition, and (3) the emotional well-being of children and youths of a specialized school who are blind and visually impaired. The study also examined whether the degree of the VI does in fact affect the parameters in question as is generally assumed. 2. The study aims to provide more literature on the importance to promote the implementation of appropriate physical activity programs and incentives in all educational settings for children with or without visual impairment. 3. The goal of the pilot study was to reveal trends in physical activity and emotional well-being of youth with visual impairments</p>

<p>In this study, VI was based on 3 categories = a) B1, no light perception in either eye, or light perception with the inability to recognize the shape of a hand. b) B2, able to recognize a hand or visual acuity of 20/600 or visual field of less than 5 degrees in the best eye. c) B3, from 20/600 to 20/200 or a visual field loss of between 20 to 5 degrees. **Youth with visual impairments, who may experience low quality of life and high levels of emotional problems (emotional unstable or introverted). **Children with VI are a low-incidence population.</p>	<p># of youth with VI = 22 (10 male and 12 female)</p>	<p># of controls = 22 (12 female and 10 male)</p>	<p>Differences in physical activity and nutritional habits between those with visual impairments and their siblings were not significant, supporting the environmentally driven nature of these variables. Associations between physical activity and well-being were not apparent in this study but may be partially explained by low participant physical activity.</p>	<p>A sample of 22 dyads of youth with visual impairments and siblings completed this study. Data were collected through parent-reported demographic and psychological well-being questionnaires, nutritional intake questionnaires, and accelerometry. Data were analyzed descriptively and inferentially, examining proportion difference using McNemar's z-test, and mean differences using multivariate analyses of variance.</p>	<p>1. The primary purpose of this study was to examine physical activity, nutritional intake, and psychological well-being differences between youth with visual impairments and their siblings residing in the same household. 2. A secondary purpose was to examine the relationship between physical activity behavior and psychological well-being among youth with visual impairments. ***The study compares levels of physical activity, body composition values, and emotional well-being of school-age children and youths with visual impairments in specialized schools with those of sighted children in mainstream schools. The results confirm the positive effects and the importance of physical activity for students with visual impairments. High levels of physical activity are possible which provide health-related benefits for children and youths with visual impairments.</p>
<p>Children were identified as vision-impaired if they met one or more of the following criteria: a parent reported a sight-related impairment that limited the child's activities (67% of sight-impaired children); a parent reported in this or any previous wave of the MCS that the child was registered sight impaired or severely sight impaired (51%); a teacher reported that the child was receiving extra help in the classroom or had a statement of special educational need because of a 'problem with sight' (31%); a parent reported that the child was receiving extra help in the classroom (12%); or had a statement of special educational need because of a 'problem with sight' (10%).</p>	<p>Parent Reports: 189 Teacher Reports: 138</p>	<p>Parent Reports: 10436 Teacher Reports: 6328</p>	<p>Vision impairment among children as young as 11 years of age is associated with an increased risk of psychiatric disorder. * Vision-impaired children aged 11 years are at risk of psychiatric disorder. • Vision-impaired children with additional special educational needs and disabilities are at greatest risk. • Health services should consider how to identify and treat vision-impaired children at risk of psychiatric disorder.</p>	<p>First, a same was drawn from Wave 5 of the MCS study (UK longitudinal study). Scores from the parent and teacher versions of the Strengths and Difficulties Questionnaire (SDQ) were used to compare sighted children with: vision-impaired children; vision-impaired children with no other reported disabilities or special educational needs; and children with vision impairment and additional disabilities or special educational needs. Logistic regression was used to measure the associations between the independent variables and SDQ scores, and to test for significance of the observed differences.</p>	<p>The purpose of the study was to compare the risk of psychiatric disturbance among sighted and vision-impaired children aged 11 years. Additionally, highlight the effects of sight impairment on children's psychosocial development, and suggest that children as young as 11 years of age and their parents are likely to benefit from specialist advice and support.</p>

<p>*For descriptive purposes, the disability status of each athlete was defined according to the International Classification for Disease (ICD) schematic (World Health Organization, 2010).</p> <p>1. Although speculative, patterns of poor fitness status and comorbidity documented in individuals with sensory impairments suggest a hypokinetic origin; that low levels of physical activity (PA) explicate the higher rates of functional decline and metabolic conditions observed in persons with visual or hearing disabilities.</p> <p>2. "Throughout childhood and adolescence, youth with sensory impairments display lower levels of HRF than age-matched peers without vision or hearing impairments. By mid-adulthood, engagement in PA falls below the level recommended for improving health, whereas by older adulthood, high rates of anxiety and depression develop concomitantly with poor functional capacity and mobility limitation."</p> <p>3. Early motor skill development was noted as being delayed and less predictable in comparison to youth without sensory impairments.</p>	<p>Among athletes with a visual impairment, two reported having no light perception (ICD = 5), five reported having light perception (ICD 2-4), and one reported having travel vision (ICD = 1).</p>	<p>3 participants reported no VI but were hearing impaired</p>	<p>It has been well documented that youth with sensory impairments display lower levels of health-related fitness than their typically developing peers, yet few programs exist to enhance the physical activity levels of these youth, even at private or state-funded schools for the deaf and blind. Following participation in the program, students displayed significant improvements in cardiovascular fitness and a shift in the types of barriers perceived to influence engagement in physical activities. ***The 14-week cross-country season began on the day following the preseason assessment. Student-athletes ran together four days per week and, at various points in the season, competed in two races with nonsensory impaired runners from surrounding middle and high schools in the region.</p>	<p>Assessments of participating students' pre- and postseason affect (e.g., PA self-efficacy and barriers to PA) and HRF status were conducted at a School for the Deaf and Blind in close proximity to the college. Evaluations were completed by a university faculty member and three undergraduate students who were trained in data collection procedures, Fitnessgram test administration, and adaptive instruction for assessing the parameters of interest in youth with vision and hearing impairments. Also, gathered preseason information regarding the participants' perceived barriers to PA, PA self-efficacy, and HRF with questionnaires.</p>	<p>The purpose of this intervention study was to document the impact of a recently developed school running program on the health-related physical fitness and self-efficacy of students with sensory impairments. "In an effort to provide information to practitioners regarding the value of running-based recreational opportunities for youth with sensory impairments, the purpose of this study was to describe the impact of the school-based cross-country running program on the HRF status and self-efficacy of participants."</p>
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<p>Children were asked to highlight if they were partially sighted or had a severe sight impairment. Additional impairments were parent-reported to enable grouping based on common terminology utilized by health professionals and related charities in the United Kingdom. "Children with a visual impairment are reported to have reduced motor skill competency and health related fitness in comparison to their sighted peers."</p>	<p>53 youth aged 5-15 years and their families participated. Youth all had parent reported VI. Youth with VI included 27 females; 38 partially sighted, 15 severely sight impaired; 38 congenital VI, 15 acquired VI; 62.3% of the children reported additional impairments including (physical impairment (n = 13), learning disability (n = 12) or both (n = 8).</p>	<p>No controls. The results were compared to general guidelines that an average amount of PA required for children overall.</p>	<p>The physical activity intervention called 'First Steps', a British Blind Sport initiative that aimed to get more children with a visual impairment more active.</p>	<p>A mixed-methods approach was used to gather participants' experiences of physical activity prior to receiving this pack and canvas opinion on how the pack changed their activity levels: A research team gathered data on individuals' physical activity patterns before and after receiving the First Steps pack as well as their feedback on the pack itself. In order to contextualise these physical activity patterns, the researchers utilised the initial questionnaire to investigate the participation of children with a visual impairment in physical activity and sport in Scotland. The experiences of children with a visual impairment in physical activity and sport naturally emerged in focus groups and interviews. The researchers have included this data to add context to findings and enable comparisons in pre- and post-pack activity.</p>	<p>The purpose of this study was to conduct an intervention with children who have a visual impairment (including those with additional impairments or medical conditions). Within this aim, there were two underlying objectives. First, to gain an understanding of their experiences of physical activity and sport and assess its effectiveness in increasing their physical activity levels and developing motor skills. Second, to report on the effectiveness of the intervention to inform future work.</p>
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QoL indicators and measures

A variety of QoL and well-being indicators were used to assess youth with VI in the studies included the present scoping review. Some examined perceptions such as the youth's perceptions of barriers [27], while others examined parental perceptions and experiences regarding their child's well-being (Columna et al., 2019). Brunen and colleagues [28], assessed QoL with a variety of scales completed by the youth, including EPQ - Neuroticism Scale and Extroversion Scale, the Rosenberg self-esteem scale, the Subjective Well-Being scale, the Hopkins Symptom Checklist, and a question regarding loneliness. Giese and colleagues [29] used the Well-being Index: WHO-5, which is a short, self-administered questionnaire that measures current emotional well-being. It includes five positively worded statements relating to positive mood (good spirits, relaxation), vitality (being active and waking up fresh and rested), and general interest (being interested in things). Each item is rated on a six-point Likert scale from 0 to 5. Haegele and colleagues [15], examined psychological well-being with the Strengths and Difficulties questionnaire.

Outcomes

In all the reviewed studies, there seems to be a common outcome that VI and physical activity are not associated. However, environmental factors may be a possible mediating factor influencing these results, including families' lack of

knowledge and/or opportunities for youth with VI to participate in physical activity. A common theme among the studies was the significant influence of environmental factors on physical activity participation, rather than individual factors, such as severity of VI. Authors reported the importance of increasing parental and teacher knowledge as well as opportunities for participation for children with VI (Columna et al., 2019; Scully & Lord, 2019).

Discussion

The present scoping review examined the existing research on physical activity and QoL in youth with VI. The findings of this search examined the types of well-being, (2) QoL indicators and measures, and (3) the outcomes. Though some results support the health-related positive effects and importance of physical activity for students with visual impairments [28], there was no connection found between severity of VI and physical activity [28,29]. It should be noted that only two of the seven studies examined severity of VI as a dependent factor. Additionally, results were mixed regarding VI leading to insufficiencies in physical activity, body composition, or emotional well-being. Environmental factors such as opportunities for youth with VI participation and increased parental and teacher support and knowledge are important to improve physical activity participation leading to the positive health-related QoL outcomes (Columna et al., 2019; Scully & Lord, 2019).

Table 3: QoL and reported barriers.

Study (authors and year)	Reported QoL barriers by youth with VI	Reported adverse events among youth with VI
<p>Brunes et al., 2015 <i>The effect of physical activity on mental health among adolescents with a without self-reported visual impairment: The Young-HUNT Study, Norway</i></p>	<ol style="list-style-type: none"> 1. The PA levels of adolescents with visual impairment may be explained by the fact that they are likely to experience multiple barriers to their involvement in such activities and some of the barriers stem directly from having a visual impairment. 2. The lower levels of mental health among adolescents with SRVI who reported a stress-reactive personality and non-weekly activity at baseline may reflect psychosocial barriers to their involvement in leisure-time PA such as overprotection and social isolation. 3. The increase in SCL-5 scores that we observed from baseline to follow-up in the SRNI category might have been unrelated to their levels of PA, but connected to other biological, social, and environmental factors. 	<ol style="list-style-type: none"> 1. There was missing data (selection bias), and information bias (misclassification of PA) which were due to withdrawal at baseline, withdrawal at follow-up, non-response either at baseline or at follow-up, and the subject of self-reporting. "We imputed data only for those who participated at baseline and was invited to participate at follow-up in order to obtain stable estimates. Of those, 63% had complete data on all variables." *Note from Discussion: "Future studies should aim to replicate the findings from our study of vision-specific associations between PA and mental health by including a larger sample of adolescents, using a randomized controlled design, using objective measures of visual impairment, and measuring various aspects of leisure-time PA (e.g. the interpersonal context of the activity). It is also recommended that future studies include a measure of personality when examining the link between PA and mental health in samples of individuals with visual impairment." 2. "The reported study is the first prospective population-based study conducted that has examined the long-term effects of PA levels on positive and negative aspects of mental health among adolescents with perceived visual impairment." 3. "Organizing leisure activities for groups of adolescents with visual impairment is challenging because there are very small number of such adolescents in the county."
<p>Columna et al., 2019 <i>Physical activity participation among families of children with visual impairments and blindness</i></p>	<p>"Researchers exploring barriers to PA among families of children with VI have indicated that parents felt there were multiple barriers to PA for their children."</p> <ol style="list-style-type: none"> 1. Parents lacked knowledge of PA programs in the community and did not know how to teach and involve their children with VI in these types of activities. 2. It is common for families of children with disabilities to not engage their children in PA because of attitudinal barriers they experience from society. 3. The children's other disabilities could have magnified barriers or created additional challenges for the parents. 4. Other researchers indicated that parents of children with Down syndrome often had to teach instructors and coaches how to better include their children in PA programming. These parents of children with disabilities, faced with constantly sharing the same story about their child with a disability with multiple PA professionals, perceived this process as tiresome and as an additional burden not experienced by parents of children without disabilities. 	<ol style="list-style-type: none"> 1. These parents may lack the skills to teach PA to their children, which would adversely hinder their perceived behavioral control to do so. Consequently, their intentions and the actual behaviors of involving their children and families in PA could be hindered, or even jeopardized. 2. The motives and intentions to perform a particular behavior, in this case engage in PA, were also influenced by subjective norms (perceived social pressure) often experienced by families of children with disabilities. 3. Inexperience in teaching PA to their children along with limited advocacy skills led parents to constrain their children's participation in PA. <p>Limitations of the Study = "This study has some limitations. First, phone interviews were used as a means of data collection, so it is acknowledged that non-verbal behaviors were missed. In the future, if participants are not available to participate on the interview process face-to-face, an online interview might be a solution (e.g., Skype or Google Hangout). Second, six of the ten participants' children had mild disabilities along with a VI. The children's other disabilities could have magnified barriers or created additional challenges for the parents. However, it is important to recognize that additional disabilities are common among children with VI. The goal of this study was to determine the knowledge and mechanisms for families to participate in PA. Many of the families in this study were considered middle class and had access to participate in PA in the community and at home. This study may not address the concerns of families from lower or higher socioeconomic classes, which may limit the transferability of findings to other families.</p>

<p>Geise et al., 2017 <i>Physical activity, body composition, and well-being of school children and youths with visual impairments in Germany</i></p>	<p>1. The facilitators included the child’s desire to be fit and active, practicing skills, family support, involvement of peers, accessibility and proximity of facilities, better opportunities, skilled staff, and information dissemination (Shields et al., 2012). According to Shields et al. (2012), these barriers and facilitators can influence the amount of physical activity of children with disabilities. 2. Low physical activity levels of school children with VI may relate to perceived barriers to participation such as the non-availability of appropriate opportunities, rather than educational setting. **Inclusion</p>	<p>1. These implications cannot be ignored in the current debate about the inclusion of students with disabilities in general education classes. “It is important to promote the implementation of appropriate physical activity programs and incentives in all educational settings.” 2. Less effective sports programs and sports environments for individuals with VI in mainstream schools are most likely the reason their PA levels are much lower than sighted peers. 3. More precisely, the barriers included a lack of skills and knowledge, the child’s preferences, fear, negative attitudes to disability, parental behavior, inadequate facilities, cost, and a lack of transport, appropriate programs, and staff capacity. 4. The facilitators included the child’s desire to be fit and active, practicing skills, family support, involvement of peers, accessibility and proximity of facilities, better opportunities, skilled staff, and information dissemination. 5. Further studies would be needed to shed light on this subject and its components as related to the type of schooling, including a comparison of mainstream schooling versus specialized schooling. This topic must also be reviewed in the light of study results from other countries where students with VI are for the most part schooled inclusively (not all students who have VI are placed in a specialized school).</p>
<p>1 Haegele et al., 202 <i>Physical activity, nutrition, and psychological wellbeing among youth with visual impairments and their siblings</i></p>	<p>1. Like physical activity engagement, consistent evidence has emerged linking unhealthy diets, which generally include processed meat and snacks, diet and sugar-rich soft drinks, fried food, and foods high in saturated fat and sugar, with poor psychosocial well-being and physical health among children and adolescents. 2. Insufficient engagement and unhealthy nutritional habits among youth with visual impairments may contribute to higher rates of health related and psychological well-being concerns during childhood. physical activity</p>	<p>1. It is difficult to place adverse events with children with VI who had sighted siblings because they found moderate correlations in MVPA (moderate to vigorous physical activity) between youth with visual impairments and their siblings, as well as research among youth without disabilities that has found highly associated levels of physical activity among siblings living in the same household. 2. Perhaps the adverse event could involve a child with a VI who is an “only child.” They might not have the same emotional connection to PA as those with siblings have. 3. The household dynamic could have variability in the influence of PA. This has important practical implications and suggests that interventions targeting parental behaviors and intentions to engage their children, both with and without visual impairments, in physical activity may have utility in enhancing these health-related behaviors.</p>
<p>Harris & Lord, 2016 <i>Mental health of children with vision impairment at 11 years of age</i></p>	<p>These effects in mental health are likely to arise partly from the limitations that vision impairment imposes on children’s ability to interact with the environment, and partly by the way in which parents and other adults respond to them. Limitations include development, communication, language development, mobility, well-being, social interaction, and participation in age-typical activities. Additionally, given the limited availability of child and adolescent mental health services for children and young people in England, there are concerns about how easily vision impaired children with behavioral and emotional difficulties can access appropriate professional support.</p>	<p>It suggests that the risk of psychiatric disturbance is likely to persist over time. Given the limited availability of child and adolescent mental health services for children and young people in England there are concerns about how easily vision impaired children with behavioral and emotional difficulties can access appropriate professional support. Parenting children with sight problems presents challenges over and above those faced by parents of sighted children. Achieving a balance between promoting independence, self-efficacy, and autonomy on the one hand and the provision of practical and emotional support on the other may be more difficult in the case of sight impaired children, especially if they have additional SEND.</p>

<p>Mueller & Ackley-Holbrook, 2016 <i>The Impact Of A School Running Program on Health-Related Physical Fitness and Self - Efficacy In Youth With Sensory Impairments</i></p>	<p>Participants completed the Physical Activity Barriers Questionnaire for the Blind or Visually Impaired ... When viewed collectively, these barriers indicate a relatively external locus of control, suggesting that extrinsic factors were commonly perceived as having a notable impact on PA prior to participating in the running program:</p> <ol style="list-style-type: none"> When examined descriptively, the types of barriers perceived to hinder participation in PA shifted from externally focused factors (“unexpected obstacles”) to primarily internally focused factors (“motivation”) following the program. PA barriers commonly reported among the general population, including restriction of time, inconvenience, inadequate knowledge of exercise, lack of motivation or confidence in oneself, and lack of access to recreational areas. Individuals with disabilities experience concomitant barriers which make access to health-promoting levels of PA even more challenging. Common barriers to PA reported by youth with sensory impairments include inadequate programming, lack of educator knowledge, inadequate motor skill, low parental expectation, and lower standards of performance. In the current study, participants identified “unexpected obstacles,” “weather (too hot or cold),” and “a lack of availability of activities” as the most substantial barriers to PA participation prior to engagement in the running program. 	<ol style="list-style-type: none"> While statistically significant reductions in perceived barriers to PA were not observed following participation in the running program, participants in the current study experienced a shift in the locus of control involving perceived barriers to PA, reporting “lack of motivation,” “lack of time,” and “inconvenience in preparing themselves” as primary barriers. In this study, “the inability to obtain formal records of practice attendance and program specifics from coaches (i.e., daily run duration or mileage) and relatively common in the translation of practice to research, this lack of formal data inhibited our ability to examine the relationship between program adherence and estimated energy expenditure on changes in HRF and exercise self-efficacy.” Youth with sensory impairments display lower levels of health-related fitness than their typically developing peers, yet few programs exist to enhance the physical activity levels of these youth, even at private or state-funded schools for the deaf and blind.
<p>Scully & Lord, 2019 <i>Developing physical activity interventions for children with a visual impairment: Lessons from the First Steps initiative</i></p>	<ol style="list-style-type: none"> Most barriers to physical activity in children with a visual impairment are environmental rather than genetic. Lower levels of health-related fitness and motor skill development in children with a visual impairment have been associated with inequitable opportunities to take part in physical activity and sport. Fear of injury is the most frequently cited barrier to participation stated by parents of children who are blind. The most common barriers stated by children with a visual impairment include being unaware of what activities to participate in, being unsure of what to do, having nobody to do activities with and being mocked by peers. 	<p>A lack of knowledge by instructors on how to adapt lessons and use modified equipment has been reported to reduce opportunities for children with a visual impairment. Studies have shown that teachers feel ill-equipped to sufficiently adapt physical education lessons for their students and fear for the child’s safety. “The prominence of parental voices in the focus group stage of the study also gives further credence to the limitations of these methods in capturing children with a visual impairment’s voice in and through research.”</p>

Therefore, it appears warranted to emphasize the availability of opportunities for participation in regular physical activity, and a curriculum with high expectations and intensive student support which focuses on the student’s needs, rather than the severity of VI [29]. This was also noted by Scully and Lord (2019), in the “The First Steps” program, which provided an activity pack to families with children with VI as well as those with VI and additional disabilities. Similarly, Haegele and colleagues [15], revealed that when children with VI and their siblings are provided similar environmental conditions, physical activity involvement was equivalent to their sighted peers. Results revealed that the participating children and youth improved their ability and confidence to perform motor skills. These studies highlight the idea that providing appropriate training, equipment, opportunities for sports and having high expectations can help children and youth with visual impairments reach motor skill and physical activity levels similar to their same age peers.

Relatedly, Mueller and Ackley-Holbrook [27] found that when external barriers prohibit participation in physical activity, it affects motivation to participate. In other words, the more the barriers presented, the less motivated children and youth are to participate in activity. Columba et al., (2019) concluded that more opportunities would help motivate children to be more active, per parental report. Brunet et al., [28] noted that the relationship between physical activity and well-being must be further studied.

Including people with disabilities in sports and physical activities can help to both improve health outcomes and social skills as well as positively impact perceptions of disability among non-disabled people [4]. The lack of accessibility in facilities, activities, and physical activity and sports programs often make people with VI feel less accepted and included [4]. Therefore, barriers which prevent youth with disabilities from being more active need to be reduced to maximize the associated physical

and social advantages [30,31]. For people with VI, participation in sporting activities is very important, particularly for health, aesthetics and fun; they are clear about the importance and benefits of physical activity for the integral development of the human being [4]. There is also a need for an expanded evidence-based understanding of the mental and social needs of children with VI, in order to improve their mental health and to enhance their psychological well-being [17].

Limitations and Future Research

The biggest limitation in this scoping review was that there was a lack of empirical research in youth with VI. Results revealed only one intervention on physical activity and QoL, indicating a dire need for more research in the area. There were also several studies that did not use validated instruments for QoL. Future studies must address the types of activities that are accessible at home, in school, and in the community that can help improve QoL. Research should include training programs so teachers, support staff, and parents will better understand the potential of children and youth with VI, as well as the instructional strategies to make sports and recreation accessible.

Conclusion

In this scoping review, seven articles were included that conducted research on physical activity and QoL for children and youth with VI. While there is limited research in the area, the research available, found limited relationships between physical activity and QoL outcomes, including mental health functioning, for youth with VI. However, the variety of data collection methods and assessment methods used across the studies may have limited our ability to discern conclusive findings across the existing studies. The identified studies also provided few answers as to the specific factors necessary to provide effective physical activity programming for youth with VI. This is certainly an area where more research is warranted. This scoping review indicated a high need for more research on the impact of physical activity on mental health and other QoL measures for youth with VI. The existing literature is limited both in its scope and its generalizability due to the paucity and inconsistency of studies in this area. Specifically, more work is needed to identify physical activity programming that is inclusive for youth with VI and to examine the specific factors that impact participation and motivation.

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