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Physical activity levels in children with sensory problems: Cross-sectional analyses from the Millennium Cohort Study

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ABSTRACT

Background: Hearing and vision impairments/problems are associated with increased risk of premature mortality in adulthood. One potential pathway explaining this association is reduced levels of physical activity. Reductions in activity levels due to sensory impairments may commence earlier in life; however, associations between sensory impairments/problems and activity levels in childhood are not well understood.

Objective: The objective of this study was to examine associations between hearing and vision problems and objectively measured activity levels in a representative sample of British children.

Methods: Data were drawn from sweep 4 of the Millennium Cohort Study, a prospective cohort study among children aged 7. Child hearing and vision problems were reported by parents in a postal survey. Children were also invited to have their physical activity measured objectively via accelerometry. A total of 6410 children had valid accelerometry data accompanied by complete survey data on the variables of interest. The main outcomes were objectively measured moderate-to-vigorous physical activity, steps and sedentary time. Adjusted linear regression was used to examine associations between vision and hearing problems and objectively measured activity levels.

Results: In this sample of 7-year old children, 16.7% (n = 1068) had a reported vision problem and 11.6% (n = 745) had a hearing problem. Reported vision problems in both eyes, but not one eye, was associated with 2 fewer minutes of moderate-to-vigorous physical activity per day (B = −2.1 95% Confidence Intervals [CI] −3.9 to −0.4) and almost 200 fewer steps per day (B = −198.4 95% CI, −398.4 to 1.6). Hearing problems were not associated with activity levels in either one or both ears.

Conclusion: Children with visual problems affecting both eyes, but not one eye, are likely to have lower levels of physical activity. Strategies to promote physical activity in children with visual problems are warranted.

Introduction

Physical inactivity (defined here as not meeting physical activity guidelines) is a major risk factor in the development of cardiometabolic disease, osteoporosis, and poor mental health.[1–5] An important factor in physical activity is that of life-long engagement, supporting life-long health, and crucially, an increased likelihood of physical activity into older age.[6–8] National government guidelines[9] suggest children should engage in "moderate to vigorous intensity physical activity (MVPA; activities that get one moving fast enough or strenuously enough to burn off three to six times as much energy per minute as one does when sitting quietly) for at least 60 min and up to several hours every day" for good health. However, physical activity levels among children in the UK are low, with reports suggesting that one third of children do not meet government recommendations.[10] Understanding the barriers to physical activity in childhood to facilitate effective physical activity

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promotion is essential.

Correlates of physical activity in children are well documented.[11,12] Importantly, low levels of physical activity are known to be a greater problem in children with disabilities.[13,14] Sensory problems, such as vision and hearing impairments may be key barriers to engagement in physical activity in children. The WHO states that in Europe 31.7 thousand people per million population are visually impaired, 28.7 have low vision and 3 are blind[15] while 32 million children across the world live with disabling hearing loss.

Limited research has explored the association with eyesight problems and physical activity. However, research has suggested that children with severe visual impairment are less physically active than their sighted counterparts.[14,16–19] However, this literature is limited, precluding any firm conclusion, owing to small sample sizes or subjective measures of activity behaviour. For example, parents reporting child physical activity may overstate actual activity levels owing to fears of being judged, or indeed may misinterpret what constitutes light, moderate or vigorous activity. Houwen, Hartman and Visser[17] found that, among a city-wide Dutch sample of ninety-six children with and without visual impairment aged 6–12 years, total activity, and participation in MVPA was significantly lower for the children with visual impairment, while time spent in sedentary and light behaviour was significantly higher. In addition, body mass index (BMI), percentage body fat, and locomotor and object control were all associated with degree of visual impairment and level of physical activity. Findings from this study are however unlikely to generalize to the UK population owing to the small sample size of children residing in the Dutch city under study. Further research is required in UK population-based samples. Nevertheless, children with visual impairment may be a group at risk of the aetiology of diseases associated with inactivity.

Perceived sociological barriers to physical activity for children with visual impairment have been reported as parental support and parents' physical activity, lack of security, motivation, professional training and information about activities.[16] From a physical perspective, children with sight impairment are less likely than their peers to feel able to carry out tasks, play organised sport, take part in physical activities, make journeys on foot outside of school on their own or with other children, and are more likely to feel tired at school all or most of the time, leading to higher inactivity.[18] Furthermore, older children who are visually impaired are less active than their younger counterparts when entering the second decade of life[14,18,19]; highlighting the need to explore this disability as an age specific correlate of physical activity. Importantly, to date no one has investigated whether the extent of visual impairment (i.e. whether in one or both eyes) has a detrimental influence on levels of free-living physical activity. Further research is required in this area.

Hearing impairment and reduced physical activity has been reported widely in older adults (see e.g. 20). Examining the physical activity levels of deaf and hearing impaired children and socio-demographic correlates,[20–22] research suggests that deaf children demonstrate similar or slightly lower fitness levels when compared to those with good hearing.[20,21,23–26] However, research is yet to explore the physical activity levels of hearing impaired children in population based samples, despite knowledge that disability is associated with increased levels of effort and higher levels of fatigue, which lead to greater inactivity.

Hearing and vision impairments are associated with increased risk of mortality in adulthood.[27] One potential pathway explaining this association is reduced levels of physical activity across the lifespan.[28,29] Reductions in activity levels due to sensory impairments may commence earlier in life; however, the associations between sensory impairments and activity levels in childhood is not well understood. The aim of the present study was to examine associations between hearing and vision problems and objectively measured activity levels in a large representative sample of 7-year old British children. We hypothesized that eyesight or hearing problems will be associated with low levels of physical activity.

Methods

The Millennium Cohort Study (MCS) is a prospective study of a nationally representative UK sample of children born at the turn of the century (between September 2000 and January 2002). Eligible children were identified from the records of Child Benefit. Information was collected on 18,818 children at 9 months of age from 1 parent (usually the child's mother). Further surveys were administered at the ages of 3, 5 and 7 years. All measures were collected in the child's home. To maximize sample size the present manuscript used data from the age 7 survey only where physical activity was objectively measured using waist worn accelerometers (Actigraph GT1M, Pensacola, Florida). Ethical approval was granted by the South West and London Multi-Centre Research Ethics Committees.

Exposure variables

Parents (predominantly mothers) reported whether child “ever had any problems with [his/her] eyesight or eyes” (yes/no); if yes “does or did it affect one or both eyes” (one/both); whether child “ever had any problems with [his/her] hearing or ears” (yes/no); if yes “does or did it affect one or both ears”. Children were classified as having no eyesight problems, eyesight problem in one eye, eyesight problem in both eyes, no hearing problems, hearing problems in one ear and hearing problem in both ears. It is important to note that the measure for visual problems used in the present study may encompass those with blindness (full or partial), eye injury, and those with 20/20 vision with correctives. The same principle applies to the measure relating to hearing problems.

Outcome variables

Physical activity, steps and sedentary time were measured objectively using Actigraph GT1M accelerometers when participants were 7 years of age (between May 2008 and August 2009). Actigraph accelerometers are a valid and reliable way to measure physical activity in young people. Full details on the accelerometry procedures have been published previously.[30] In brief, accelerometers were delivered by mail to consenting participants and programmed to record data at 15-second intervals (15-second epoch length). Participants were instructed to wear the accelerometers around their waists during waking hours, and to take them off during water-based activities, for 7 consecutive days. Devices were returned and information was downloaded using Actigraph software. A total of 6675 children (3176 boys) met the inclusion criteria, which was set as having at least 2 days with 10 h or more of wear time. Time spent engaging in physical activities of varying intensities was derived using cutpoints generated from a prior calibration study in 7-year-old children. Specifically, time sedentary was classified as fewer than 100 counts per minute, and time in MVPA was classified as more than 2241 counts per minute. All outcome measures were approximately normally distributed. Thus, no transformations were required.

Covariates

Parents/carers (usually mothers) reported child(ren)'s sex, age, ethnicity (classified as White British or Other) and income

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