

Physical activity among older adults with visual impairment: A scoping review

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1 Abstract

2 In this paper, we present a scoping review of literature on aging, visual impairment, and
3 physical activity. Our objectives are to: (a) explore the available literature on aging, physical
4 activity, and sight loss; (b) describe how participation in physical activity by older adults with
5 visual impairment is understood by researchers; and, (c) identify benefits, barriers, and
6 facilitators of physical activity participation as reported by older adults with age-related sight
7 loss. Over 2000 sources were reviewed, with 30 studies meeting eligibility criteria. Findings
8 were organized into four thematic categories, namely: (a) participation rates; (b) health
9 inequalities; (c) barriers to physical activity participation; and, (d) benefits of physical
10 activity participation. Through this scoping review process, extant knowledge was
11 synthesized and gaps in the literature were critically assessed. To address these gaps, several
12 avenues for future research are outlined and described, alongside a consideration of the
13 implications of the scoping review findings for both policy and practice.

14

15

16 *Keywords:* visual impairment, sight loss, older adults, physical activity, scoping review

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20 Physical activity among older adults with visual impairment: A scoping review

21 The health benefits of participating in regular physical activity have been well
22 documented (Hallal et al., 2012). Physically active older adults are seen to have lower risk of
23 disease, including dementia, and higher levels of physical and cognitive function,
24 psychological well-being and independence than inactive older adults (Craig, Mindell, &
25 Hirani, 2008; United Kingdom's Department of Health (DoH, 2011). Yet many people,
26 especially as they grow older, fail to undertake even the minimum amounts of physical
27 activity that are recommended for health (30 minutes of at least moderate physical activity on
28 five or more days per week) (Davis, Fox, Hillsdon, Coulson, & Thompson, 2011). This
29 scenario is exacerbated for those experiencing some form of disability, such as visual
30 impairment (Department for Work and Pensions, 2013).

31 Almost two million people in the United Kingdom (UK) are living with visual
32 impairment that has a significant impact on their daily lives (Fight for Sight, 2013). This
33 phenomenon is increasingly linked to age, with 1.7 million people over the age of 65 having
34 significant vision loss (McLaughlan, 2006). The health and well-being of this growing and
35 aging population requires attention, yet despite these figures, little research exists concerning
36 physical activity among older people who are visually impaired. While statistics on physical
37 activity participation by older adults (60+) with sight loss are unavailable, an alarming
38 picture emerges if we are to consider the combined impact of: (a) the prevalence of age
39 related sight loss, (b) the increasing number of older adults within our society, and, (c) the
40 particularly low levels of physical activity within older cohorts and among people with a
41 disability.

42 The DoH physical activity recommendations are as relevant to older adults with sight
43 loss as their sighted peers. To date, however, both research and policy have had little to say
44 about the involvement of older adults who are experiencing late onset sight loss, nor how

45 their participation can be facilitated. Policy makers and organizations cannot assume that
46 what is known about one population (e.g., older people with sight; young physically active;
47 young people with visual impairment) can simply be copied into recommendations for
48 promoting physical activity for another population (e.g., older adults with age-related sight
49 loss). Developing knowledge regarding this specific group is necessary to make meaningful
50 changes in activity levels and subsequent health and well-being indicators. The first step in
51 the development of knowledge in this area is to respond to the question: *what is known about*
52 *physical activity in relation to older adults with visual impairment?*

53 Addressing such a question is not straightforward. The reason is largely due to issues
54 surrounding definitional terms and inconsistencies regarding who counts as physically active,
55 old and visually impaired. For example, while the World Health Organization (2015) defines
56 physical activity as any bodily movement produced by skeletal muscles that requires energy
57 expenditure, for significant health benefits to be incurred (our underlying driver for focusing
58 attention on this somewhat forgotten group), physical activity must be undertaken at a
59 moderate intensity and for a certain period of time. To make claims about whether a group is
60 physically active or not, requires objective measurement. There are multiple ways of
61 measuring physical activity. These include the use of accelerometers, pedometers, and self-
62 reported questionnaire (Davis et al., 2011; Tudor-Locke & Myers, 2001). For the purposes of
63 this review, the term physical activity is interpreted broadly to include both objectively and
64 subjectively measured activities.

65 Similar definitional issues exist in relation to the term “older adults”. Indeed ‘old age’
66 can be defined socially, biologically and chronologically (Vincent, 2003). Moreover, the
67 ‘number’ ascribed to it differs across disciplines. For example, while the literature in adult
68 development and exercise and sport sciences typically identifies with the traditional
69 retirement age of 65 years, the general principle of public health is that upstream intervention

70 earlier in the life course is preferable to attempting to cure in later life. Accordingly,
71 discussions around improving health and well-being in ‘older age’ often focus on the fifth
72 decade (Rachel, Doyle, Grundy, & McKee, 2009). This latter, broader conceptualization of
73 older age is employed within this study.

74 Finally, the terms ‘sight loss’ or ‘visual impairment’ can encompass a broad spectrum
75 of eye conditions and sight experiences that might range for occasional spectacle / contact
76 lens use to being registered as blind (severely visually impaired). Measuring visual
77 impairment can include self-report (e.g. “I have significant difficulty undertaking daily
78 tasks”), objective measures such as a person’s visual acuity (VA – central vision that is used
79 to see detail) and visual field (VF – how much one can see around the edge of vision, while
80 looking straight ahead), the results of which certify someone as being either sight impaired
81 (partially sighted) or severely sight impaired (blind) (Royal National Institute for the Blind,
82 2015). In addition, the presence of eye conditions known to impact negatively upon a
83 persons’ sight is also often used to categorize individuals as being visually impaired or
84 otherwise. Such eye diseases include: age-related macular degeneration (AMD), diabetic
85 retinopathy, diabetic maculopathy, cataracts and glaucoma. For this review, visual
86 impairment is defined broadly to include any age-related loss of vision that cannot be entirely
87 corrected with the use of lenses (i.e., glasses or contact lenses).

88 Inconsistencies with the definitions of physical activity, older age and visual
89 impairment have negative implications for the claims that can be made from the extant
90 research. Standardization of terminology is therefore an important area requiring more
91 focused attention in future. That noted, the purpose of this scoping review is to offer a picture
92 of a landscape that is largely unknown. Accordingly, our preoccupation at this stage was not
93 to become embroiled in definitional dilemmas. These might have detracted us from being
94 able to offer an original (and early) contribution to knowledge through the amalgamation of

95 current thinking, and a subsequent informed response to the question, *what is known about*
96 *physical activity in relation to older adults with visual impairment?* The following section
97 describes the scoping review approach in more detail.

98 **Scoping Review**

99 The aim of a scoping review is to identify the nature and extent of the research
100 evidence on a given topic (Grant & Booth, 2009). It involves systematically reviewing the
101 literature with the purpose of mapping the key concepts underpinning a research area (e.g.,
102 physical activity, aging, and sight loss) along with the main sources and types of evidence
103 available (Mays, Roberts, & Popay, 2001). A scoping review is desirable compared to other
104 types of reviews for two reasons. First, most kinds of methods for reviewing literature funnel
105 down on a narrow research question. These methods only examine research data that have
106 been collected using certain techniques (e.g., quantitative questionnaires *or* qualitative
107 interviews), and do not tend to span disciplines. Second, many reviews do not go beyond the
108 research findings nor seek to identify gaps in the existing literature or problems with the
109 research. Scoping reviews, however, include and disseminate findings from a range of
110 different methods (Mays et al., 2005). They critically address broader topics where many
111 different study designs might be applicable. Other reasons for using a scoping study are
112 described by Arksey and O'Malley (2005). These authors note how:

113 A key strength of the scoping study is that it can provide a rigorous and transparent
114 method for mapping areas of research...This analysis in turn makes it possible to
115 identify the gaps in the evidence base, as well as summarizing and disseminating the
116 research findings. By presenting the results in an accessible and summarized format,
117 policy makers, practitioners and consumers are better placed to make effective use of
118 the findings. (Arksey & O'Malley, 2005, p. 30).

119

120 That noted, and of relevance to our point above regarding how we dealt with definitional
121 dilemmas, scoping reviews are not intended to offer the final answer on a topic. Rather, their
122 value connects to the ability to ascertain in general terms, what we know, what we do not
123 know, and whether a full systematic review of evidence is required (Grant & Booth, 2009).

124 The aim of the scoping review reported here was to generate knowledge on physical
125 activity among older people with visual impairment. Specifically, the objectives of the review
126 were to:

- 127 • Explore the available literature on physical activity, aging, and visual impairment;
- 128 • Describe how participation in physical activity by older adults with visual impairment
129 is understood by researchers;
- 130 • Identify benefits of, and barriers and facilitators to physical activity participation in
131 relation to older adults with visual impairment;
- 132 • Identify implications of these findings for policy;
- 133 • Identify future research directions to inform the advancement of theory, policy and
134 best practice.

135

136

Method

137 According to Arksey and O'Malley (2005), there are five stages that constitute a
138 scoping review. The five stages, along with the manner in which they were applied to the
139 topic in question, are presented below.

140 **Stage 1: Identify the Research Question**

141 The research question in this instance was: 'What is known from the existing
142 literature about physical activity in relation to older people with visual impairment?'

143 **Stage 2: Identify Relevant Studies**

144 To identify studies on physical activity, aging, and visual impairment, different
 145 sources were searched, including electronic databases, reference lists, key journals in
 146 university libraries, conference proceedings, relevant organizations and existing networks.
 147 Key words related to the project (i.e., physical activity (/leisure/sport) AND sight loss
 148 (/partial sight/visual impairment) AND ageing (/aging)), were entered into the following
 149 databases: AMED (EBSCO), Science Direct, Wiley Online Library, SocINDEX, CINAHL,
 150 MEDLINE (PUBMED), and GOOGLE SCHOLAR. Grey literature – defined as non-peer
 151 reviewed but published studies – was also reviewed, from national and local-level sight loss
 152 organizations as well as sporting and governmental authorities.

153 **Stage 3: Select Studies That Meet the Inclusion Criteria**

154 The following inclusion criteria were applied to identified studies:

- 155 • The research (or commentary) contributes to an understanding of physical activity and
 156 older adults with visual impairment.
- 157 • The research was published in English, either in a peer reviewed journal or as grey
 158 literature produced by an organization with a vested interest in this topic including sight
 159 loss charities (e.g. Royal National Institute for the Blind), disability organizations (e.g.
 160 English Federation of Disability Sport), sport and physical activity advocates (e.g.
 161 Women in Sport).
- 162 • The research was published in 1999 or thereafter.
- 163 • Empirical papers primarily focused on adults over the age of 55 years. Where younger
 164 participants were also included in the sample, publications would only be included if
 165 there was a specific focus on the older participant (in terms of findings / discussion /
 166 recommendations) within the text.

167 Study selection criteria were finalized *post hoc*, based on increasing familiarity with the
 168 literature, that we could then apply to all of the citations to determine their relevance. For

169 example, due to a dearth of literature covering each of the three relevant topic areas (i.e.,
170 physical activity, aging *and* visual impairment), what constituted physical activity was
171 widened to include mobility and ‘activity limitation’ measures, as well as broad measures of
172 leisure-time activities. Two reviewers then applied the inclusion criteria to all of the citations,
173 ensuring a uniform approach to all studies included in the review.

174 The search yielded over 2200 papers, excluding duplicates. Titles and abstracts were
175 screened against the inclusion criteria, and 109 publications were selected for inclusion based
176 on title and abstract. From these, 88 were excluded after full text review, resulting in 21
177 included articles. Papers were excluded when (a) the sample consisted solely of children or
178 young adults (<25 years of age), or ages were not reported, (b) the type of visual impairment
179 was either congenital or stable from childhood (i.e., not age-related or deteriorating over
180 time), or the type of visual impairment was not reported, and (c) the sample combined visual
181 impairment with other sensory and/or physical impairments and did not distinguish between
182 them in terms of findings, discussion or recommendations. Reference chaining yielded a
183 further seven articles, and two documents were located in a search for relevant grey literature
184 resulting in a total of 30 studies (see Figure 1).

185 **Stage 4: Chart the Data**

186 Using a technique called ‘charting’, we synthesized and interpreted the data by sifting,
187 charting and sorting material according to key issues and themes. Each author independently
188 charted the included citations, and categories were agreed upon and confirmed by consensus.

189 **Stage 5: Collate, Summarize and Report Results**

190 Here data were described and interpreted. Findings are reported in the results section.
191 Because the literature exploring physical activity and sight loss in older age is diffuse and
192 diverse, the included publications were characterized by heterogeneity of design, sample
193 characteristics, outcome assessment and outcomes examined. Consequently the data could

194 not be pooled for comparison or analytical purposes. However, critical analysis of collected
195 data is neither the aim nor purpose of a scoping review. Such a review does not seek to
196 synthesize evidence or to aggregate findings from different studies, and makes no attempt to
197 assess the quality of evidence (Arksey & O'Malley, 2005). Instead, we present an overview
198 of all the material reviewed, identifying the breadth of available literature and key issues and
199 themes therein (Green & Thorogood, 2004). Through this process, we were able to ascertain
200 the dominant areas of research and interest on the topic, identify contradictory evidence and
201 any significant gaps in the knowledge base, and consider possible implications and future
202 research directions for policy-makers.

203 **Results**

204 A thematic assessment of the literature (Ritchie & Spencer, 1994) identified four
205 broad subject areas into which included literature could be grouped. These were: a)
206 participation rates; b) health inequalities; c) barriers to physical activity participation; and d)
207 benefits of physical activity participation.

208 **Participation Rates**

209 Many of the included publications reported on population-based, epidemiological
210 studies and employed analysis of existing survey data. As such, the samples were not made
211 up solely of older adults with visual impairment, but measures of visual impairment and
212 visual acuity were collected (self-report and clinical eye tests). The secondary survey data
213 were then analyzed to evaluate the effect of visual impairment on (activity) participation
214 rates. In general, evidence was presented that sensory impairments (and visual impairment in
215 particular) are associated with reduced participation in activities (Clark, Bond & Sanchez,
216 1999). Definitions and outcome measures as they pertained to 'activity' varied widely, but
217 across the board those with vision loss/visual impairment reported consistent disparities in
218 leisure activities and social participation (Crews & Campbell, 2004; Heyl, Wahl, &

219 Mollenkopf, 2005). Visual impairment was reported to be a significant risk factor for activity
220 limitations and participant restrictions, as people with vision problems were less likely to
221 participate in an exercise program, walked less, and did less physical activity on the whole
222 than their sighted peers (Crews & Campbell, 2001).

223 Other included publications drew their samples specifically from the older population
224 with visual impairment, recruiting from low-vision rehabilitation centers, eye clinics, sight
225 loss organizations, and senior's centers. Again, research designs varied and 'activity' was
226 diversely defined. However, findings were similar: a) older adults with visual impairment
227 participated less in heavy household activities, recreational activities, and sports activities
228 when compared to the sighted population (Alma et al., 2011); b) compared with people
229 without visual impairment of the same age and sex, those with visual impairment had a lower
230 level of participation in all domains (including fitness and leisure) (Desrosiers et al., 2009);
231 and, c) the greatest areas of restriction of participation were associated with reading, outdoor
232 mobility, participation in leisure activities, and shopping (Lamoureux, Hassell, & Keeffe,
233 2004). The degree of sight loss was important, in that greater levels of visual field loss were
234 associated with substantial reductions in physical activity and walking (Ramulu et al., 2012),
235 and decreased visual acuity was associated with restricted 'important life aspects' including
236 work, reading, and sports/leisure (Coyne et al., 2004). Burmedi, Becker, Heyl, Wahl, and
237 Himmelsbach (2002) found that the decline in leisure activities occurs mainly in those
238 activities that require the greatest visual ability, and thus noted that age-related low vision
239 seems to be highly detrimental to mobility and the pursuit of vision-dependent leisure
240 activities.

241 As Burmedi et al. (2002) note, because leisure activities are more voluntary and
242 optional in nature than activities of daily living (ADL), psychological (e.g., motivational)
243 variables are more prevalent with respect to individual engagement and participation. In

244 addition, other variables such as age, health, and marital status can contribute to increased
245 vulnerability with regard to leisure activities (Stevens-Ratchford & Krause, 2004). An
246 influential characteristic identified through the scoping review was that of health inequalities.

247 **Health Inequalities**

248 Health inequalities among older adults with visual impairment were well-documented.
249 Research designs were epidemiological in nature. For example, one article found that lowered
250 vision is a risk factor for injurious accidents independent of mobility and physical activity
251 (Kulmala, Tormakangas, Parssinen, Rantanen, & Heikkinen, 2008a). However, the primary
252 approach within this thematic category consisted of longitudinal research on samples with
253 existing, diagnosed eye conditions. Swanson, Bodner, Sawyer, and Allman (2012) found that
254 older adults with lower levels of visual acuity have reduced levels of leisure-time physical
255 activity, and an overall reduction in caloric expenditure even after controlling for health-
256 related confounding variables (e.g., age, gender, race, education, location, BMI, Geriatric
257 Depression Scale score, cognitive-status score, validated comorbidity index, and number of
258 medications taken). These findings echo and overlap with literature on participation rates in
259 general. From this view, participation rates are lower *because* of the visual impairment itself,
260 and impairment is the cause of participation/activity restriction. Consequent inactivity then
261 leads to and, indeed, compounds the various established health inequalities of those with
262 visual impairment. For example, Seddon, Cote, Davis, and Rosner (2003) evaluated
263 anthropomorphic, behavioral and medical factors associated with progression to advanced
264 stages of age-related macular degeneration, finding that increased levels of physical activity
265 tended to decrease the risk of disease progression.

266 On the other hand, several scholars included in this scoping review examined the
267 presence and impact of co-morbidities on physical activity participation, positioning
268 particular health inequalities as barriers and constraints for the older adult with visual

269 impairment. Having performed a secondary analysis of survey data, Crews, Jones, and Kim
270 (2006) found that older adults with visual impairment frequently experience comorbid
271 conditions, and these conditions are associated with difficulties in walking and climbing
272 steps, shopping, and socializing, and resulted in significantly more self-reports of declining
273 health during the previous 12 months. The most intensively investigated comorbid condition
274 was that of depression. Jones, Rovner, Crews, and Danielson (2009) found that older adults
275 with visual impairment who had depressive symptoms were more likely than adults with
276 neither condition to smoke, be physically inactive, have poor health, have difficulty with self-
277 care, and have lower social participation. Poorer visual acuity (VA) was associated with
278 greater activity loss and more depressive symptoms (Rovner & Casten, 2002). For this
279 reason, it is suggested that depression (as a health inequality) neither causes physical
280 inactivity nor is caused by it – rather there is a strong correlation between the two.

281 However, as Kulmala et al. (2008b) emphasized, whatever the reason or cause for
282 physical inactivity within the older visually impaired population, it requires attention because
283 lowered vision is a significant predictor of mortality. They explained that increased risk of
284 mortality is attenuated by lower walking speed, physical inactivity, cardiovascular diseases,
285 injurious accidents, diabetes and depressed mood (Kulmala et al., 2008b). In summary, health
286 inequalities can thus act as barriers to physical activity participation, but in many cases
287 physical activity can also benefit the visually impaired older adult in helping to reduce some
288 of these health inequalities.

289 **Barriers to Physical Activity Participation**

290 Beyond a consideration of health inequalities, the scoping review did not unearth
291 many studies that focused in detail on barriers to physical activity participation among older
292 adults with sight loss. Indeed, merely four included articles fell into this category and these
293 were divergent in nature. The first, by Wahl, Heyl, and Schilling (2002) explored the

294 interrelations between vision impairment, outdoor activity, and life satisfaction in older
295 adults. Their findings highlighted the importance of considering visual functioning alongside
296 other psychosocial mediators, including motivational forces and personality aspects (such as
297 extraversion and openness to experiences) (Wahl et al., 2002). The argument made was that
298 engagement in outdoor activities does not relate to one's fundamental independence, and so it
299 has more to do with the optional use of opportunity structures to improve one's life quality
300 (Wahl et al., 2002). As such, lack of motivation for physical activity can be a barrier to
301 participation among individuals with visual impairment.

302 Another important barrier to physical activity participation was identified by Rudman
303 and Durdle (2008), who explored how older adults with low vision experience and manage
304 community mobility – that is, the ability to travel to places outside the home by various
305 means of transportation. This work discovered that participants continually gauged risks
306 associated with mobility and engaged in risk avoidance and management strategies – often
307 restricting community mobility because of perceived risks, and leading to reduced
308 participation in a range of physical, social, and other activities. A core element of community
309 mobility was living with a pervasive sense of fear of: (a) the risk of bodily harm, and (b) not
310 being able to interact in the world in ways that supported personally valued qualities
311 associated with one's sense of self and lifestyle (Rudman & Durdle, 2008).

312 Thirdly, Rimmer (2006) provided an overview of the major areas that required
313 consideration to improve access to various physical activity venues for people with vision
314 loss. This author aligned this commentary with the social model of disability, which posits
315 that disability is the result of socio-structural barriers that serve to exclude and restrict people
316 with impairments. Although not specific to the older adults per se, yet still a useful insight
317 into designing physical activity programs for people with visual impairment, Rimmer (2006)
318 discussed four areas where attention to inclusivity could reduce potential barriers to

319 participation: the physical built environment (i.e., pavement grade and quality, lighting,
320 obstacles, signage, etc.), exercise equipment (i.e., voice activated, raised lettering or braille
321 consoles on cardiovascular machines), group exercise classes (i.e., awareness and training of
322 coaches, physical guidance), and commercial and print media (i.e., alternative formats).
323 These recommendations are equally relevant to older adults with a visual impairment.

324 Lastly, the English Federation of Disability Sport (Rankin, 2012) produced a
325 qualitative research report with the aim of better understanding the real and perceived barriers
326 that may prevent people who are disabled and Deaf from taking part in sport. Their sample
327 consisted of four impairment-specific focus groups, one of which was made up of individuals
328 who were blind and partially sighted. Again, this research did not solely address the older
329 visually impaired population. However, there were older individuals (up to age 63) taking
330 part. A wide range of barriers to participation in physical activity was reported, including
331 those regarding accessibility (of buildings and/or equipment), a lack of awareness and/or
332 training by staff/program leaders, insufficient opportunity for participation (particularly for
333 those past school age), poor dissemination of information, and risk of injury. This report,
334 considered as a piece of relevant grey literature, also included participant-led
335 recommendations for changes needed to address and remove the experienced barriers
336 (Rankin, 2012). As one example, participants suggested the provision of disability awareness
337 training to staff of all fitness facilities, as well as within sports degree curriculums at colleges
338 and universities.

339 **Benefits of Physical Activity Participation**

340 The report produced by the English Federation of Disability Sport (Rankin, 2012) also
341 identified several benefits of sport participation for individuals who are disabled and Deaf.
342 Focus group members (who had a range of ages and disabilities, but included older adults
343 with visual impairment) suggested that participating in sport offers: fun, a learning

344 opportunity, an opportunity for progression and improvement, confidence-building,
345 improvement in physical fitness, and socializing opportunities. The social and confidence
346 benefits of physical activity participation were also echoed within literature specific to older
347 adults with visual impairment (Green & Miyahara, 2008). Again, this work highlighted the
348 importance of considering personal and situational factors on levels of physical activity,
349 including degree of visual impairment, personal history and experience with physical activity,
350 living environments, and social interactions (Green & Miyahara, 2008).

351 Surakka and Kivela (2008) found that older adults with visual impairment who
352 participated in a 6 week physical training program all experienced improvements with respect
353 to physical condition, mental state, and balance. The scoping review found that the majority
354 of research considering the benefits of physical activity for older adults with visual
355 impairment covers similar areas (i.e., falls and balance, mobility and strength). Some of the
356 research in this category was concerned with exploring these topic areas within a cohort,
357 prospective setting. For example, de Boer et al. (2004) examined and established the role of
358 physical performance, functional limitations, and physical activity as mediators in the
359 association between visual impairment and falls and fractures. Another type of research
360 within this theme was intervention based: evaluating exercise or physical activity programs
361 delivered to older adults within a visually impaired population setting. Within this type of
362 research, physical activity is proposed as a tool for fall prevention. Included articles
363 considered home exercise programs (Campbell et al., 2005), strength, balance and walking
364 training (Kovacs et al., 2012) and Tai Chi classes (Chen, Fu, Chan, & Tsang, 2012). All of
365 these studies reported improved functional mobility, strength, proprioception and balance,
366 and confidence as well as fewer incidences of falls.

367

368 **Mapping gaps**

369 This scoping review examined research findings of published and grey literature on
370 the topic of aging, visual impairment, and physical activity. In addition to highlighting what
371 *is* known about this issue, such a review can also illustrate important trends relative to
372 existing knowledge gaps. For example, with respect to participation rates in the UK, there is
373 no precise record of how many older adults with visual impairment are participating in
374 physical activity. There is substantial evidence demonstrating that physical activity levels
375 decrease with age. Meanwhile, prevalence rates indicate that visual impairment increases
376 with age. However, to date, these figures have not been combined to produce an accurate
377 representation of this specific issue. Understanding the scale of the situation is a crucial
378 starting point for any future research in this area. A level of sophistication in this process is
379 required to capture the complexity of visual impairment, the multiple forms it can take (i.e.,
380 in terms of level and nature of vision, and timing of vision loss) and the subsequent impact of
381 these differences on activity levels.

382 Research into the health inequalities that are experienced by older adults with visual
383 impairment have largely concentrated on why inequalities are experienced. As an example,
384 for some older adults, visual impairment leads to inactivity, which results in health
385 inequalities (e.g., depression). For other older adults with a visual impairment, it is the
386 specific health inequality (e.g., depression) rather than the visual impairment itself that leads
387 to inactivity (McDonall, 2009; 2011; Rovner & Casten, 2002). This focus on the various
388 pathways to physical inactivity has permitted useful insight into a generally overlooked
389 cohort. That said, what is missing is a focus on *how* health inequalities might impact upon
390 one's subjective experiences of having the opportunity to participate in physical activity.

391 Despite the plethora of literature exploring older people's barriers to physical activity
392 (i.e., Booth, Bauman, & Owen, 2002; Lim & Taylor, 2005; Schutzer & Graves, 2004), only

393 four research papers specific to older adults with visual impairment were identified in this
394 scoping review. Clearly, there is a great need for further research in this area if we are to fully
395 capture and subsequently act upon the additional challenges that this cohort might face
396 relative to their involvement in physical activity. This avenue of inquiry would do well to
397 consider barriers in terms of their co-existence, as opposed to examining each in isolation.
398 For example, addressing the accessibility of the physical built environment within a fitness
399 facility might need to be considered alongside the social *and* psycho-emotional barriers that
400 older adults with visual impairment may also face (Thomas, 2007).

401 The social model understands disabled people as socially oppressed, and asserts that
402 disability is not caused by impairment but by the social barriers (structural and attitudinal)
403 that people with impairments (e.g., physical, sensory, and intellectual) come up against in
404 every arena. However, the psycho-emotional dimensions of individual's lives with a
405 disability are not deliberately attended to within the social model (Goodley, 2011; Smith &
406 Sparkes, 2012; Thomas, 2007). For example, psycho-emotional disablism "...involves the
407 intended or unintended 'hurtful' words and social actions of non-disabled people...in
408 interpersonal engagements with people with impairments" (Thomas, 2007, p. 72). As such,
409 we are left with an inadequate understanding of the complex ways in which people with a
410 disability are restricted from engaging in physical activity. In light of this inadequate
411 understanding of disability, and recent criticisms of the social model (see Goodley, 2011),
412 one possible way forward is to consider the social *relational* model of disability as described
413 by Thomas (2007). This has not been attended to in terms of adults with visual impairment.
414 However, it holds much potential value.

415 The social relational model describes disability as "a form of social oppression
416 involving the social imposition of restrictions of activity on people with impairments *and* the
417 socially engendered undermining of their psycho-emotional well-being" (Thomas, 2007, p.

418 73, italics added). Conceptualized this way, this model uniquely extends the social model by
419 proposing that it is not just the physical environment that restricts people's physical activity.
420 The social relational model also deliberately proposes that restrictions of activity arise when a
421 person's psycho-emotional well-being is damaged. One way this damage can occur, and thus
422 activities restricted, is through interactions with other people. For example, a person's
423 psycho-emotional well-being might be damaged when a group of people at the gym aim
424 hurtful words at them or when the gym manager claims that because they are visually
425 impaired they pose a 'health and safety' liability. In such social interactions, the potential
426 damage and/or undermining of the older adult's psycho-emotional well-being might result in
427 their future avoidance of the gym altogether. Hence, damage to psycho-emotional well-being
428 can place limits on what one *can do* and *can become*.

429 Another gap that can be observed from this review revolves around the benefits of
430 being physically active for older adults with visual impairment. Much of this research can be
431 located within the falls prevention literature and predominantly aims to address the additional
432 challenges that aging with a visual impairment might entail (e.g., balance). While making a
433 useful contribution to knowledge, this emphasis comes at the expense of an appreciation for
434 other benefits that might be derived from participation (e.g., social interaction, enjoyment,
435 development of new skills). In addition, the extant literature seemingly overlooks the variety
436 of available opportunities with regards to type of activity that can be undertaken (facilities
437 permitting). To gain a more comprehensive understanding of how and why physical activity
438 can benefit older adults with visual impairment, there is a need to examine a variety of
439 activities beyond those typically examined (i.e., T'ai Chi and yoga).

440 A final gap that can be observed from this scoping review revolves around the
441 methods and methodologies that are used to understand physical activity among older adults
442 with visual impairment. Traditionally, quantitative methods have largely been relied upon.

443 Innovative qualitative methods are needed to further extend knowledge and facilitate change.
444 This might involve exploring other sensorial dimensions of physical activity for older adults
445 with a visual impairment by adopting an ethnographic approach or developing sensory
446 awareness in qualitative interviews (Sparkes & Smith, 2012; Harris & Guillemin, 2012).
447 Similarly, the use of Global Positioning Systems (GPS) and *geo-narrative* (see Bell, Phoenix,
448 Lovell & Wheeler, 2015) data could offer important insight into the typical movements,
449 activities and interactions in relation to specific environments.

450 Moreover, rather than simply producing research *about* older adults with visual
451 impairment, researchers might harness the benefits of participatory action research (PAR)
452 that promotes working *with* older adults with visual impairment throughout the entire
453 research process (from identifying the research questions to disseminating the results and
454 implementing change). As a collaborative methodology, which is founded on the assumption
455 that academic researchers and community members can come together in some ways to
456 create and change practices, PAR would offer the benefit of developing knowledge from the
457 actual standpoints of older adults with visual impairment themselves about which methods
458 are best for research (Kemmis & McTaggart, 2000). Significantly, and perhaps most
459 importantly, PAR contributes to the discovery and development of the conditions and actions
460 for social change that are both meaningful and sustainable for the population being studied
461 (e.g., see Holt et al., 2013).

462 **Concluding Comments**

463 Given the growing proportion of older adults experiencing and living with sight loss,
464 this article presented a scoping review to illustrate what is known (and not known) about
465 physical activity participation within this population. Addressing multiple types of literature,
466 we hope this comprehensive knowledge synthesis will guide research, government, and non-
467 profit/charity agendas. Seeking a focused understanding of physical activity among older

468 adults with sight loss, a review of the 30 included sources identified four main themes that
469 summarize what is known about aging, physical activity, and visual impairment. These
470 themes are characterized by a focus on: (a) *participation rates*: measuring and recording the
471 rate of physical activity participation within this population; (b) *health inequalities*:
472 measuring, recording, and collating the health risks and experiences faced by older adults
473 with sight loss (often linked to activity restrictions); (c) *barriers to physical activity*
474 *participation*; and (d) *benefits of physical activity participation*. Using insights gleaned from
475 the scoping review, we suggest that participation in physical activity has significant
476 implications for older adults with sight loss. An example is the potential for physical activity
477 to improve balance and decrease falls, and thus decrease injuries and accidents within this
478 population.

479 The many differences in background, reporting, aim, content and implementation of
480 research on physical activity, aging, and visual impairment made it challenging to undertake
481 systematic comparisons. However, this scoping review represents a first step toward
482 developing a set of heuristics for decision-makers and health professionals to begin
483 addressing physical activity as an important health and leisure practice in the lives of older
484 adults with sight loss. Many decision-makers are seeking academic support and advice in
485 moving forward in this area. Ultimately, the intention of such research would be to produce
486 best practice guidelines to maximize engagement with physical activity among older adults
487 with sight loss. Clearly, further study is needed before there is sufficient evidence to make
488 such recommendations as, 'if you are 60+ and visually impaired, then X and Y are the
489 appropriate physical activities for you'. It is necessary for future work in this area to be more
490 consistent with terminology, measures and definitions of visual impairment, age
491 categories/distinctions, and physical activity. Careful consideration of the context and the
492 individual must also occur before any particular approach to encouraging participation is

493 adopted. The next immediate step is to identify specific research projects to address key gaps
494 identified through this scoping review. In our view, this can only be done through
495 collaboration between decision-makers faced with real world constraints in designing and
496 delivering activity opportunities, older adults with a visual impairment themselves, and
497 researchers with interests in this important topic area.
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669 **Table 1 – Publications included in the review.**
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No.	Authors	Number of participants	Age range of participants	Type(s) of visual impairment represented
1.	Clark et al. (1999)	1052	70 - 103	Determined by clinical assessment and self-report “conclusion: vision impairments are more likely to lead to reductions in activities than hearing impairments, particularly when the activities are physically demanding or optional” (p. 124)
2.	Rovner et al. (2009)	206	64+	AMD VA of 20/70 or worse (in better eye)
3.	Crews & Campbell (2004)	9447	70+	Participants self-reporting vision problems in Second Supplement on Aging II (SOA-II, National Center for Health Statistics)
4.	Heyl et al. (2005)	1519	55 - 98	VA \leq 0.02 (functional blindness according to criteria of the German Ophthalmological Society)
5.	Crews & Campbell (2001)	8767	70+	Representative population, not all VI, survey asked 8 questions re vision.
6.	Alma et al. (2011)	173	55+	Newly registered visually impaired older persons at Royal Dutch Vision (a low vision rehabilitation provider).
7.	Desrosiers et al. (2009)	64	65+	VA worse than 20/70 or VI < 60 degree in better eye.
8.	Lamonreux et al. (2004)	319	Mean age 78.4 \pm 12.9	VA <6/12 (better eye)
9.	Ramulu et al. (2012)	141	60-80	Diagnosed with glaucoma

10.	Burmedi et al. (2002)	Narrative review	Articles regarding “the elderly”	Various
11.	Coyne et al. (2004)	15	61 ± 12.3	Diagnosed with diabetic retinopathy
12.	Stevens-Ratchford et al. (2004)	2	75, 85	AMD
13.	Seddon et al. (2003)	261	60+	AMD
14.	Swanson et al. (2012)	911	65+	VA worse than 20/50 and 20/80
15.	Crews et al. (2006)	49278	65+	Self-defined as VI within large population based sample.
16.	Jones et al. (2009)	49278	65+	Variety of VI, severity not stated.
17.	Rovner & Casten (2002)	51	64+	AMD with VA <20/70
18.	Kulmala et al. (2008a)	416	75 - 80	Comparison between ‘visually impaired’ (VA = < 0.3), ‘lowered vision’ (VA = > 0.3 but < 0.5) and ‘normal’ (VA > 0.5).
19.	Kulmala et al. (2008b)	416	75 - 80	Comparison between ‘visually impaired’ (VA = < 0.3), ‘lowered vision’ (VA = > 0.3 but < 0.5) and ‘normal’ (VA > 0.5).
20.	Wahl et al. (2002)	404	55+	Various – measured VA & subjective visual functioning.
21.	Rudman & Durdle (2008)	34	70+	Low vision – defined as “a degree of sight loss, even with glasses or contacts, which significantly affects daily functioning”.
22.	Rimmer (2006) - Commentary	N/A	N/A	N/A
23.	Rankin (2012)	31	18-63	“blind or partially sighted”
24.	Green & Miyahara (2008)	6	53 - 70	Various (RP, AMD, Cataracts etc.)
25.	Suraka & Kivela (2008)	27	31 – 75 (mean age 54)	Partially sighted, Blind, Deaf-blind (n=4)
26.	De Boer et al. (2004)	1509	65+	Contrast sensitivity, self-reported visual impairment assessed by face

				recognition from distance of 4m, reading small print and problems with glare.
27.	Kovaks et al. (2012)	41	60+	Various: multiple, AMD, DR, Glaucoma, Cataracts.
28.	Campbell et al. (2005)	391	75+	VA of 6/24 or worse
29.	Chen et al. (2012)	40	65+	Low vision or blind
30.	Crews (2003) - commentary	N/A	N/A	N/A

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673 **Figure 1: Search Strategy**

