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REVIEW ARTICLE

The association between vision impairment and social participation in community-dwelling adults: a systematic review

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Abstract

Vision impairment (VI) is an important contributor to the global burden of disability and is associated with decreased well-being. Recent research has attempted to devise a conceptual framework to explain the health consequences of VI. One proposed mechanism by which VI leads to declines in well-being and other adverse health and disability outcomes is through limitations in social participation (SP). SP is an integral component of overall functioning, optimal aging, and well-being, and reductions in SP are associated with lower health-related quality of life. The purpose of this systematic review was to appraise the existing literature on the relationship between VI and SP. The protocol for this review was registered on PROSPERO (CRD42018102767) and adhered to PRISMA guidelines. A comprehensive search of five databases (MEDLINE, EMBASE, PsycINFO, Scopus, Sociology Database) yielded 881 unique studies, of which 19 met inclusion criteria. Among the 19 included studies, 18 concluded that VI was associated with reduced SP and one reported mixed results. Bias was assessed using the Effective Public Health Practice Project Quality Assessment. In the quality assessment, four studies were rated "moderate" and fifteen were rated "weak." There was wide variation in study populations and measurement of VI and SP. In conclusion, there is consensus that VI is associated with reduced SP. However, more rigorous study design and better standardization in the assessment of VI and SP could facilitate valid comparisons across populations, diseases, and levels of VI. Attempts to provide vision rehabilitation and mitigate the effects of VI on overall health and well-being might consider strategies to improve SP.

Introduction

Worldwide, vision impairment (VI) and blindness affect more than 250 million people [1]. Prior research has shown that VI is associated with decreased health-related quality of life, an increased risk of falls, depression, cognitive decline, and loss of independence [2]. A number of studies have also suggested that vision loss may have a negative impact on social functioning. This is notable since participation in valued social activities can have important health benefits, including increased well-being, decreased anxiety and depression, and even lower rates of dementia and mortality [3].

Social participation (SP) has been studied using a variety of different conceptual frameworks, including the World Health Organization International Classification of Functioning, Disability, and Health (ICF) [4]. The ICF is a broad model that aims to describe the diverse contributors to overall health and well-being, including health conditions, the body, environmental factors, and participation. However, some contend that SP is not adequately characterized in the ICF since it does not distinguish fully between limitations in activities (e.g., hobbies) and social engagement [5–7]. Consequently, others have adopted more nuanced models such as the National Health and Aging Trends Study Disability Framework [8] and Levasseur et al.'s Taxonomy of Social Activities [5] to conceptualize SP and its relationship to health and well-being.

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Since there is no consensus definition of SP, it can be challenging for vision researchers and medical providers to discern the association between VI and SP. However, assessing this relationship may be important for promoting overall health, well-being, and vision-related quality of life through comprehensive vision rehabilitation. In order to develop targeted vision rehabilitation strategies that include the promotion of SP for those with poor vision, it is vital to understand more fully the association between VI and SP [9]. Accordingly, in this systematic review, we summarize the current understanding of the association between VI and SP in community-dwelling adults. The objective of this systematic review is to help researchers and clinicians to address gaps in the current understanding of the relationship between VI and SP and to design interventions that promote social functioning in visually impaired adults.

Materials and methods

Protocol and registration

This systematic review was registered on the PROSPERO International prospective register of systematic reviews (CRD42018102767; www.crd.york.ac.uk/prospero) and followed the guidelines for conducting systematic reviews from the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) checklist (Supplementary Table) [10].

Inclusion and exclusion criteria

This review included all studies that quantitatively evaluated the association between VI and SP in community-dwelling adults. Papers were included if they met all of the following criteria: (1) studies of community-dwelling adults age 18 and older; (2) studies that included objective (e.g., visual acuity, visual field, contrast sensitivity, and stereopsis) or subjective (e.g., self-reported) vision assessments; (3) studies that provided quantitative measures of SP; (4) studies that reported a measure of the association between VI and SP; and (5) publications in English, including conference papers and abstracts published from January 1988 to June 2018. We included retrospective or prospective studies, including but not limited to cross-sectional, cohort, case-control, and clinical trial study designs. We also included studies examining dual sensory loss if they reported the independent association between VI and SP.

Studies were excluded from our review if they met any of the following conditions: (1) studies conducted with a focus on a narrow population (e.g., pregnant women, cognitively impaired individuals, students, etc.); (2) studies that only reported the combined impact of dual sensory loss on SP; (3) studies with an explicit focus on other conditions (e.g., multiple sclerosis, cerebral palsy, Parkinson disease, Alzheimer dementia, congestive heart failure, etc.) that could have confounded the association between VI and SP; and (4) studies that measured SP as part of a multidimensional scale with a single summary score, since in these cases it was not possible to discern the association of VI with SP specifically.

Search and selection

A comprehensive search of five databases (MEDLINE, EMBASE, PsycINFO, Scopus, and Sociology Database) was conducted using the following search terms: ("VI" OR "vision loss" OR "poor vision" OR "low vision" OR "visual impairment" OR "visually impaired" OR "loss of vision" OR "blindness") AND ("SP" OR "social involvement" OR "social engagement" OR "community participation" OR "community involvement" OR "community engagement"). Reference lists of published articles were hand searched and study authors were contacted for additional information when necessary. Studies were included if they were published between January 1988 and June 2018 in English and met the stated inclusion and exclusion criteria.

One author (KS) collected all studies found in the initial search and imported these into Systematic Review Accelerator (CREBP, Bond University, Queensland, Australia) to perform de-duplication. Two authors (KS and CRF) performed initial screening to exclude studies that did not meet the review criteria. The same two authors (KS and CRF) applied inclusion and exclusion criteria independently to remaining studies and the senior author (JRE) arbitrated any disagreements and made the final decision to include or exclude studies. Data were collected based on a modified version of the Cochrane Data Extraction and Assessment Template and collated using Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA) [11].

Social participation (SP)

In order to distinguish between activity and participation restrictions, we adopted Levasseur et al.'s Taxonomy of Social Activities [5], which describes SP using a six-level hierarchy. In this hierarchy, the lowest three levels include activities such as being with others but not interacting, whereas the highest three levels include a "person's involvement in activities that provide interaction with others in society or the community." Therefore, for the purpose of this review, we defined SP as belonging to levels 4–6 of the Taxonomy of Social Activities. The ability to distinguish between activity and participation restrictions in this review was important since prior research has demonstrated that activity and participation restrictions represent distinct constructs [7].

Data extraction

Data were collated from included publications and entered into an Excel spreadsheet (Microsoft, Redmond, WA). Criteria that were abstracted from each study included: (1) study author and year of publication; (2) type of study (e.g., cross-sectional, case-control, etc.); (3) location where the study was conducted; (4) ocular condition(s) of study participants; (5) method of VI assessment (e.g., VA, VF, self-report); (6) outcomes measured in addition to SP (e.g., activities of daily living, mental health, etc.); (7) recruitment strategy; (8) sample size; (9) mean age of the study sample; (10) whether the study had a control group; (11) conclusions of the study; and (12) risk of bias.

Quality assessment and data analysis

Two authors (KS and CRF) independently assessed the risk of bias in each study using the Effective Public Health Practice Project Quality Assessment Tool (EPHPP) [12]. This instrument was developed for use in public health and provides a standardized method to assess study quality and develop recommendations for study findings. Studies have demonstrated that EPHPP is a valid and reliable instrument for assessing study bias [13–15], and it has been used widely in prior systematic reviews. The EPHPP assesses: (1) selection bias; (2) study design; (3) confounders; (4) blinding; (5) data collection methods; (6) withdrawals and dropouts; (7) intervention integrity; and (8) analysis. Selection bias was graded on the likelihood and extent to which study participants were representative of the target population. Confounders were assessed to determine the degree to which studies controlled for variables that were associated with both the exposure and outcome. Data collection methods and analysis depended on the validity and reliability of measurement tools and on the appropriateness of statistical methods. Three other domains including "blinding," "intervention integrity," and "withdrawals and dropouts" were not applicable since no study was classified as a clinical trial. Following the validated EPHPP assessment strategy [12], for each included study the five relevant domains were ranked on a three-point Likert scale with three representing a low risk of bias ("strong"), two a possible risk of bias ("moderate"), and one a high risk of bias ("weak"). An overall rating was derived following the EPHPP methodology. A study consisting of at least one "weak" rating was not able to receive an overall rating higher than "moderate," while those with two or more "weak" ratings were automatically classified as "weak" overall based on the EPHPP assessment.

A narrative synthesis was constructed from the findings of each included study. The synthesis was structured around the type of study, target population characteristics, and measures of VI and SP. When available, maximally adjusted odds ratios, relative risks and/or 95% CIs were abstracted to illustrate the magnitude of the association between VI and SP. Three researchers were primarily involved in the review, with two summarizing and grading the quality of the evidence (KS and CRF) from each study and a third (JRE) adjudicating any discrepancies.

The University of Michigan institutional review board deemed this study exempt because data were collected and synthesized from previously published studies in which informed consent has already been obtained by the investigators. The study followed the tenets of the Declaration of Helsinki.

Results

There were 881 studies that met search criteria. Of these, 817 were excluded based on review of the titles and abstracts. Among the remaining 64 studies that underwent full-text review, 19 met all inclusion criteria and were qualitatively analyzed. Full details of the systematic review process are illustrated in the PRISMA flow diagram in Fig. 1.

Association between VI and SP

Table 1 presents data summarizing key features of each of the included studies. Eighteen studies (95%) were cross-sectional and one was a longitudinal cohort study. Studies included participants from 18 different countries on four continents, including one study that was multi-national with data from 11 European countries. Sixteen of the studies did not focus on participants with a specific eye disease, while one focused on age-related macular degeneration, one on diabetic retinopathy, and one on glaucoma.

Eighteen studies (95%) concluded that VI was associated with reduced SP. One study reported mixed results that showed participants with VI perceived more restrictions in socializing with others, but not in brief interpersonal interactions and relationships.

Vision and SP measures

Visual acuity was the most commonly used metric to assess visual function ($n = 12$, 63%). Visual acuity cutoffs to define VI ranged from <20/40 to <20/70. Self-reported measures of visual function were used to define VI in 11 studies (58%). These measures varied, with some asking respondents to rate their vision on a Likert scale, while others asked about difficulty with various daily activities, and others asked participants if they had trouble seeing. Seven studies (37%) used visual field criteria to define VI, and one study used contrast sensitivity.

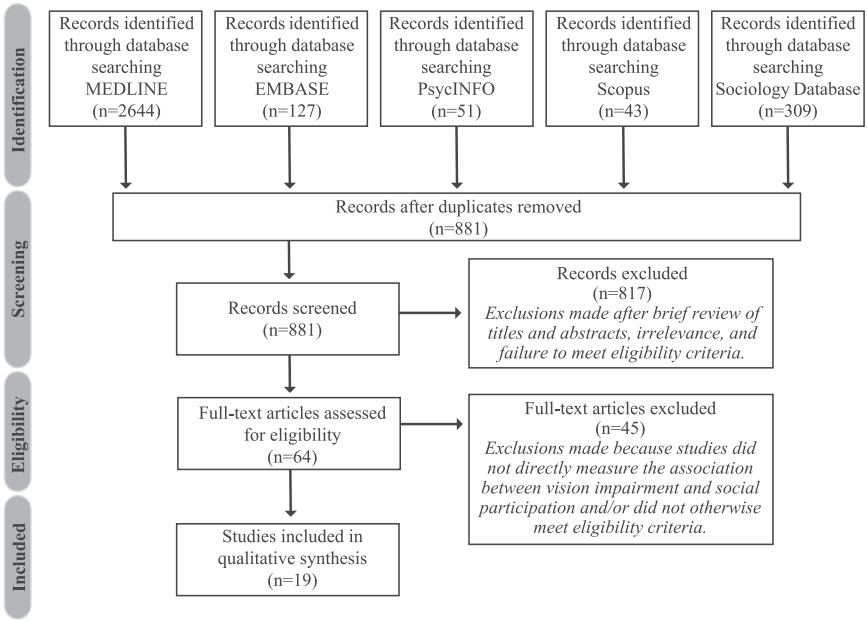

Fig. 1 Preferred reporting items for systematic reviews and meta-analyses literature search flow diagram.

Measures of SP also varied across studies. Four studies (21%) used the ICF framework as a basis for assessing SP. Ten studies (53%) used different formal validated questionnaires for assessing SP, and the remaining five (26%) used informal or non-validated survey questions.

Quality assessment

Most studies recruited participants from a convenience sample ($n = 11$, 58%) and were cross-sectional ($n = 18$, 95%). For each study, Table 2 divides the bias assessment based on the five applicable domains of the EPHPP, in addition to an overall study rating. The risk of confounding was influenced by study design, as more than half the studies (53%) received a ranking of "weak" in the confounders domain due to lack of appropriate data and/or inadequate adjusting, matching, or stratifying.

Overall, four studies (21%) were categorized as "moderate" (e.g., possible risk of bias) and fifteen (79%) were categorized as "weak" (e.g., high risk of bias). No study received an overall rating of "strong" because all had a "weak" rating for study design; in all but one case this was due to studies being cross-sectional, a design that is considered "weak" in the risk of bias assessment.

Discussion

Understanding the relationship between poor vision and SP is an important step toward promoting health and well-being in visually impaired adults. This systematic review found that there is strong agreement in the scientific literature that VI is associated with reduced SP. However, there was also a moderate to high risk of bias in all studies. This systematic review makes several important contributions. First, it highlights the importance of adopting standard definitions and assessment tools for research on complex health-related constructs like SP. In addition, the consistent association between poor vision and restricted SP points to an unmet opportunity to develop, evaluate, and implement models of vision rehabilitation that promote SP, which could ultimately improve health, well-being and vision-related quality of life.

Quality of evidence

Our systematic review evaluated bias among the 19 included studies utilizing the validated EPHPP [12]. Most included studies were cross-sectional and used convenience sampling to select participants who were seeking vision services. Consequently, these studies were susceptible to selection bias and may have yielded estimates that do not reflect true associations in the target population. Ten of the eleven studies that utilized convenience sampling reported that VI was associated with reduced SP, while one study found that VI was associated with reduction in socializing with others but was not associated with restrictions in brief interpersonal interactions and relationships. Studies that used convenience samples may have underestimated the true association between VI and SP, since those seeking eye care or vision rehabilitative services may be more likely to have access to supportive care, an opportunity to interact with those providing care, and/or a chance to meet others facing similar challenges. Of the remaining 8 studies that used a systematic sampling strategy, 2 had a "weak" rating in just a single domain, and all reported that VI was associated with reduced SP.

Table 1 Characteristics of studies that evaluated the association between vision impairment and social participation.

Study author [Ref.]	Study design	Study site	VI measure	Study outcomes	Sampling strategy and sample frame	Sample size	Mean age	Control group	Conclusions and measure(s) of association	Bias assessment
Alma et al. [29]	Cross-Sectional	Netherlands	VA, VF, subj.	SP, ADLs	Convenience; adults ≥55 seeking vision services	173	72.3	No	Those with VI were restricted in socializing, but not in interpersonal relationships.	Weak
Alma et al. [30]	Cross-Sectional	Netherlands	VA, VF	SP, ADLs, mental health	Convenience; adults ≥55 seeking vision services	173	72.3	No	VI leads to SP restriction; severity of VI has no effect.	Weak
Bachar et al. [31]	Cross-Sectional	Jerusalem	VA, VF	SP	Convenience; adults 45–65 seeking vision services	150	NR	Yes	Blind subjects showed less social engagement.	Weak
Cimarolli et al. [32]	Cross-Sectional	New York, United States	VA, CS, subj.	SP, ADLs, social support	Convenience; adults ≥65 seeking vision services	364	82.79	No	Worse visual function was associated with less social engagement.	Weak
Crews et al. [33]	Cross-Sectional	United States	Subj.	SP, ADLs	Stratified random; national survey of adults ≥70	9447	NR	Yes	Seven out of eight social activities were sig. reduced in those with VI (ORs ranged from 0.6 to 0.9).	Weak
Desrosiers et al. [34]	Cross-Sectional	Quebec, Canada	VA, VF	SP, ADLs	Convenience; adults ≥65 seeking vision services	132	79.3	Yes	Social roles of participants with VI were sig. reduced.	Weak
Gallagher et al. [35]	Cross-Sectional	Ireland	Subj.	SP, ADLs	Convenience; national survey of disabled adults 16–65	1304	42.89	Yes	The greatest difficulty for those with blindness was participation in society.	Weak
Jaarsma et al. [36]	Cross-Sectional	Netherlands	VA, subj.	Sports participation	Convenience; adults ≥18 seeking vision services	643	49.1	No	VI was negatively associated with participation in sports, but level of VI had no significant influence.	Weak
Jones et al. [16]	Cross-Sectional	United States	Subj.	SP, ADLs, mental health, physical health	Stratified random; national survey of adults ≥65	40695	NR	Yes	Reduced SP in blind people compared with those with no VI AOR = 2.85 (2.04, 3.97).	Moderate
Lamoureux et al. [9]	Cross-Sectional	Australia	VA, VF	SP, ADLs, mental health, physical health, other social	Convenience; adults ≥18 seeking vision services	319	78.4	No	Distance VA was a significant predictor of SP.	Moderate
Lamoureux et al. [37]	Cross-Sectional	Australia	VA	SP, ADLs, mental health, physical health, other social	Convenience; adults ≥18 seeking vision services	45	67.5	No	Participants with severe VA (VA < 20/200) experience greater restriction of participation.	Moderate
Latorre-Arteaga et al. [38]	Cross-Sectional	Spain	Subj.	SP, mental health	Stratified random; national survey of Roma adults ≥16	22174	NR	Yes	SP in the Roma population is significantly associated with vision.	Weak
Matthews et al. [39]	Cohort (longitudinal)	England	Subj.	SP, mental health	Stratified random; national survey of adults ≥50	8581	66.46	Yes	Changes in social engagement are affected to a greater magnitude by deterioration of self-reported vision.	Weak
Mick et al. [40]	Cross-Sectional	Canada	Subj.	SP, other social	Stratified random; national survey of adults 45–85	21241	NR	Yes	Vision loss was associated with reduced SP. OR 1.20 (1.04–1.39).	Weak
Naël et al. [41]	Cross-Sectional	France	VA	SP, ADLs	Stratified random; regional survey of adults ≥65	709	84.3	Yes	Participants with severe VI (>20/63–20/40) were more likely to be restricted (RR = 2.08; 95% CI:1.25–3.47).	Weak

Table 1 (continued)

Study author [Ref.]	Study design	Study site	VI measure	Study outcomes	Sampling strategy and sample frame	Sample size	Mean age	Control group	Conclusions and measure(s) of association	Bias assessment
Pongsachareonnont et al. [42]	Cross-Sectional	Thailand	VA	SP	Convenience; rural community-dwelling adults ≥50	327	67.6	Yes	VI was significantly associated with low social engagement (adjusted OR 4.13, CI 1.47–11.59).	Weak
Viljanen et al. [43]	Cross-Sectional	Europe	Subj.	SP	Stratified random; multi-national survey of adults ≥50	27536	65.2	Yes	Participants who reported VI had an OR of 1.77 (95% CI 1.56–2.00) for being socially inactive.	Moderate
Yang [44]	Cross-Sectional	Toronto, Canada	VA, VF, subj.	SP, mental health	Convenience; adults ≥50 seeking vision care	118	NR	No	Those with greater glaucoma severity had more difficulty with social roles ($p < 0.01$).	Weak
Zimdars et al. [18]	Cross-Sectional	England	Subj.	SP, ADLs, mental health, physical health, other social	Stratified random; national survey of adults ≥50	11392	NR	Yes	The following associations with VI were reported (ORs): not voting: 1.5 (1.1–1.9). no volunteering: 2.5 (1.8–3.3). no cultured activities: 3.1 (2.5–3.8). no hobbies: 2.5 (1.9–3.2).	Weak

ADLs activities of daily living, *AOR* adjusted odds ratio, *CI* confidence interval, *CS* contrast sensitivity, *OR* odds ratio, *RR* relative risk, *SP* social participation, *Subj* subjective, *VA* visual acuity, *VF* visual field, *VI* vision impairment, *NR* not reported

A secondary finding was heterogeneity in the measurement and reporting of SP. Studies measured SP using a variety of instruments. Similarly, VI was assessed by self-report in some studies and by several different objective measures of visual function in others. The parameters used to define SP and VI may have impacted results across and within studies. For example, Jones et al. found that restricted SP had a stronger association with self-reported blindness (adjusted OR = 2.85 [95% CI 2.04–3.97]) than with self-reported VI (defined as "trouble seeing, even with glasses or contact lenses," but not blind; [adjusted OR 2.19, 95% CI 2.00–2.41]) [16]. This finding suggests that severity of VI could be associated with the likelihood of SP restrictions. However, when another study used the same definition of SP, but defined VI based on having received a referral for low vision services, the investigators failed to detect a difference in SP between the study sample and controls [17].

In future studies, a more standardized approach to measurement of VI and SP could be implemented. This would facilitate comparisons across different studies, performance of meta-analyses, and an even more in-depth understanding of the relationship between VI and SP across different populations. Items measuring SP should only reflect participation restriction, which must be assessed separately from activity restriction, an important but distinct construct [7]. Ultimately, research in this area would benefit substantially from the adoption of single valid, reliable, and unidimensional consensus instrument to measure SP.

Association between VI and SP

This systematic review found that there is strong consensus in the literature that VI is associated with reduced SP. However, since nearly all of the studies in this review were cross-sectional, causality cannot be determined. Findings suggest that higher order activities in Levasseur's Taxonomy of Social Activities (levels 4–6) [5], such as collaborating with and helping others, and contributing to society, may be more sensitive to changes in vision than lower order activities like "being around" others (level 2). For example, Alma et al. reported a positive association between VI and reduced involvement in clubs/associations and sports participation, but not with assisting others or engaging in brief interpersonal interactions [17]. Similarly, Zimdars et al. found that VI was more strongly associated with membership in an organization and participation in cultural activities than it was with the quality of relationships with friends and family [18]. These results imply that those social activities that may be likely to provide the greatest benefit—for example, interacting with people and communities—may also be the most challenging for those with poor vision.

Table 2 EPHPP quality assessment of included studies.

Study author [Ref.]	Selection bias	Study design	Confounders	Data collection methods	Analysis	Global rating of methodological quality
Alma et al. [29]	Moderate	Weak	Weak	Weak	Moderate	Weak
Alma et al. [30]	Moderate	Weak	Weak	Strong	Strong	Weak
Bachar et al. [31]	Weak	Weak	Weak	Moderate	Moderate	Weak
Cimarolli et al. [32]	Weak	Weak	Weak	Strong	Moderate	Weak
Crews et al. [33]	Strong	Weak	Weak	Weak	Moderate	Weak
Desrosiers et al. [34]	Moderate	Weak	Weak	Strong	Strong	Weak
Gallagher et al. [35]	Strong	Weak	Weak	Strong	Strong	Weak
Jaarsma et al. [36]	Weak	Weak	Weak	Weak	Weak	Weak
Jones et al. [16]	Strong	Weak	Moderate	Strong	Strong	Moderate
Lamoureux et al. [9]	Moderate	Weak	Moderate	Strong	Strong	Moderate
Lamoureux et al. [37]	Moderate	Weak	Moderate	Strong	Strong	Moderate
Latorre-Arteaga et al. [38]	Strong	Weak	Moderate	Weak	Moderate	Weak
Matthews et al. [39]	Strong	Weak	Strong	Weak	Moderate	Weak
Mick et al. [40]	Strong	Weak	Moderate	Weak	Moderate	Weak
Naël et al. [41]	Strong	Weak	Strong	Weak	Moderate	Weak
Pongsachareonnont et al. [42]	Weak	Weak	Moderate	Strong	Moderate	Weak
Viljanen et al. [43]	Strong	Weak	Moderate	Strong	Moderate	Moderate
Yang [44]	Strong	Weak	Weak	Strong	Strong	Weak
Zimdars et al. [18]	Strong	Weak	Weak	Weak	Moderate	Weak

Quality assessment tool for quantitative studies. http://www.nccmt.ca/registry/view/eng/14.html. Strong = 3 points, low risk of bias; Moderate = 2 points, possible risk of bias; Weak = 1 point, high risk of bias

EPHPP effective public health practice project. *From:* Effective Public Health Practice Project (1998)

There are numerous hypotheses that could explain the association between VI and SP. Intuitively, VI may cause a reduction in SP directly since VI can make it challenging for people to leave their homes and enter spaces where social activities normally occur [17, 19]. Poor vision may affect other factors, such as activity limitations, that in turn lead to reduced SP. In addition, VI and reduced SP are both associated with depression [20–23], though it is not known whether depression is a confounder, mediator, or result of the association between VI and SP. It is also plausible that reduced SP could lead to an increased incidence of VI, if those who are less socially engaged are also less likely to get eye exams, as some prior studies have suggested [24]. Future studies should explicitly investigate the directionality and causal pathways between VI and SP in order to test the aforementioned hypotheses.

Implications

Poor vision and restricted SP are both associated with decreased health, well-being and health-related quality of life [9]. An improved understanding of the relationship between VI and SP is crucial for informing future work to develop and evaluate interventions that promote SP and well-being for visually impaired adults. Some studies suggest that incorporating a problem-solving approach into low vision occupational therapy could improve SP [25, 26]. A team-based vision rehabilitation approach that included ophthalmic nursing, ophthalmology, optometry, social work, occupational therapy, and rehabilitation counseling also had a positive effect on SP [25]. However, therapeutic approaches that included cognitive restructuring and education/functional training did not appear to have a positive effect [26]. In stroke survivors, exercise has proven to be an important component of rehabilitation strategies that improve SP [27]. The benefits of exercise included improved physical ability to leave the home and elevated mood. A similar approach could be valuable for promoting SP in those with VI. The role of co-occurring cognitive and mental health conditions as well as physical disorders should also be explored since VI rarely occurs in isolation. Targeting each of these may maximize the effect of comprehensive rehabilitation.

Strengths and limitations

There were several limitations to this study. Since measures of SP and VI were heterogeneous, it was difficult to compare results across studies and it was therefore not feasible to perform a meta-analysis. We only included studies

published in English, though several included studies were from non-English speaking countries. In addition, a majority of studies had an overall "weak" rating on the bias assessment, leaving open the possibility that conclusions from these studies were biased. In the bias assessment, cross-sectional observational studies received a "weak" rating on the study design domain, and any study with a "weak" rating in one or more domains cannot receive an overall "strong" bias assessment. Because no studies included in this systematic review were interventional, three of the eight bias assessment domains were inapplicable. Strengths of this study include a comprehensive search through five databases; adherence with the PRISMA methodology for conducting a systematic review [10] and the EPHPP for assessing study bias [12]; and a focus on SP, an emerging topic in vision science that to date has not been systematically appraised but is highly relevant to a holistic and patient-centered approach to optimizing vision-related quality of life.

Conclusions

There is strong consensus in the literature that VI is associated with reduced SP in community-dwelling adults [28]. The number of adults with VI in the United States is expected to more than double over the next 30 years. Consequently, these findings have important implications as researchers, medical providers, and caregivers attempt to maximize overall health and well-being in adults with poor vision. In future work, investigators should develop and employ a standardized measure of SP. Additional research is also needed to evaluate longitudinally the association between VI and SP in order to determine causality, the factors that mediate this pathway, and the accommodations that are useful for decreasing social limitations in this population. Understanding the relationship between VI and SP is vital to the development of future interventions to promote SP and, ultimately, to improve health and well-being in visually impaired adults.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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