The Barriers and Facilitators to the Implementation of Interventions for Children with Visual Impairments, Their Parents/Guardians or Educators: A Systematic Scoping Review


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The barriers and facilitators to the implementation of interventions for children with visual impairments, their parents/guardians or educators: A systematic scoping review

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ABSTRACT

A body of research indicates the importance of interventions for promoting the development and progress of children with visual impairments. However, the research available on suitable interventions for this population is relatively sparse. The purpose of this review is to identify, collate and appraise the available research evidence on implementation barriers and facilitators of interventions for children with visual impairments, their parents/guardians or educators.

A systematic scoping search of peer-reviewed literature (including grey literature) was conducted from 15 June 2016 to 7 August 2016 and 2 May 2019 to 5 May 2019. Initial searches identified 6,802 papers with 15 meeting the inclusion criteria. Three additional articles were identified through hand searching giving a final total of 18 included studies. The methodological quality score of the studies was variable with 61% scored in the average quality range. Sensory strategies, a family centred approach, in-service training and routines-based activities were identified as implementation facilitators. Barriers were a lack of adaptive equipment and training for parents and professionals, complicating factors associated with the child’s disability and an absence of specialists in interventions.
Effective intervention strategies differ for this targeted population which requires individualised applications associated with teacher and parent/guardian training. For health or education professionals who work with children with visual impairments, the outcomes of this review suggest that a detailed assessment and identification of the individualised needs of children and their families, coupled with carefully designed and tested support practices to meet their individualised needs as well as promoting integrated working between health and care services, can optimise the positive implications for future practice. Along with this, future consideration should be given to the identification of the needs of children with visual impairments and additional disabilities in order to facilitate the adjustment of intervention strategies for this group.

**KEYWORDS**

Children, intervention, carers, practice, visual impairment

**Introduction**

The World Health Organization (WHO) estimates that approximately 19 million children (aged between 0 and 14) worldwide have visual impairments, and 14 million of these children are blind (WHO, 2012a, 2017). Childhood blindness comprises a relatively small percentage (4%) within global causes of blindness (WHO, 2017). However, the conditions which cause visual impairments in childhood are highly varied, and the conditions can be associated with additional disabilities which require multidisciplinary support strategies for affected children (Rahi, 2005). As such, a range of services are required to support this population and their families as early as possible after diagnosis in order to prevent developmental risks (Campbell, 2007; Fraiberg, 1977; van den Broek et al., 2017; Webster
Yet the research evidence regarding the most effective and beneficial approaches in this area is scarce.

As the uniqueness and complexity of a child’s conditions makes it difficult to accurately address the needs of children, most often interventions take place to provide a multidisciplinary assessment and support for this population. However, previously conducted reviews on interventions for children with visual impairments (children (VI)) report that the research evidence is still limited to a generalised intervention model for this population. This is because existing studies have been carried out with a heterogeneous sample and small sample size which makes it difficult to identify a single intervention model for this population (Pérez-Pereira & Conti-Ramsden, 1999; van den Broek et al., 2017).

**Interventions for children with visual impairments**

Support for children (VI) and their families can be provided through interventions in the child’s life at multiple stages. Most often support at an early age is provided through early intervention services by considering the critical period of early life development (Celeste & Kobal Grum, 2010; Chen, 2014; Fraiberg, 1977; Hatfield & McCutchen, 2008; McLinden & McCall, 2016; Pérez-Pereira & Conti-Ramsden, 1999; van den Broek et al., 2017).

Early intervention services have a comprehensive structure to minimize developmental delay through systematic practices and family support is an integral part of these services (Celeste & Kobal Grum, 2010; Ely, Gullifor, & Hollinshead, 2017; Kobal Grum & Kobal, 2010; Ross, 2017; Wiley, Parnell, & Belhorn, 2016). Early intervention for children (VI) aims to optimize residual light perception and promote development,
growth and independent living, as well as provide support for families and minimize the cumulative effects of additional disabilities (Allen, 2011; Brambring, Rauh, & Beelmann, 1996; Chen, 2014; Fazzi, Signorini, Bova, Ondei, & Bianchi, 2005). Early intervention and support strategies additionally promote access to education and healthcare services (Allen, 2011; Brambring et al., 1996; Chen, 2014).

For children (VI), accessing education is as important as access to health care services in terms of promoting lifelong learning and progress. However, children (VI) and their families still face difficulties in getting access to education services and the delivery of essential learning materials (WHO, 2012b). Specifically, school age interventions aim to reduce these potential risks relating to access to education. School interventions provide multi-layered support in different skill areas such as communication and socio-emotional skills, fine motor and gross motor skills, cognitive skills and orientation and mobility (Chen, 2014; Stearns, 2017). The implementation of interventions can differ in order to meet the individualised needs of children by personalising the teaching methods (Chen, 2014; Wiley et al., 2016).

Interventions for school-age children can involve specialists, and health and education services, by incorporating schools to increase the effectiveness of interventions (Chen, 2014; Stearns, 2017). Along with this, if qualified professionals (such as qualified teachers of children with visual impairments (QTVI) or orientation and mobility specialists) are involved in interventions, they can provide an additional contribution and provide further assistance for children and school personnel (Bruce, Ferrell, & Luckner, 2016; Opie, 2018). The comprehensive structure of school interventions can promote access to information, modification of the learning environment, or adaptation of materials.
alongside a core curriculum (Brambring et al., 1996; Chen, 2014; Fazzi et al., 2005). Therefore, the consideration of different variables in implementing interventions, such as types of primary diagnosis, coexisting disabilities and the nature and degree of vision, can help to utilise adaptive support strategies (Correa-Torres & Bowen, 2016; Lewis & Collis, 1997; van den Broek et al., 2017).

Despite the evidence on the effectiveness of interventions for children (VI), we still know very little about the barriers and facilitators to the implementation of existing interventions (Brambring et al., 1996; Chen, 2014). This, in itself, is a barrier to optimising the learning and development opportunities for children (VI). Based on the gaps identified, the aim of this review is to synthesise the existing evidence on the components of interventions designed for children (VI), their parents/guardians or educators. To achieve this aim, this synthesis will address issues relating to the barriers and the facilitators of the design and implementation process for interventions for children (VI), their parents/guardians or educators. This review has two main objectives.

1. To identify the main barriers and facilitators of positive outcomes in existing evidence.

2. To identify the potentially beneficial components of existing interventions designed to support children with visual impairments, their parents/guardians or educators.
Methods

This scoping review was based upon a framework for conducting scoping reviews (Arksey & O’Malley, 2005). Scoping reviews are beneficial for mapping the key concepts of an area which is complex or has not been researched extensively in the literature. This review includes five key steps (1) identifying the research objectives (2) identifying the relevant studies (3) study selection (4) charting the data and collating and (5) summarising and reporting the results (Arksey & O’Malley, 2005, p. 9). In this review, primary searching and quality appraisal was conducted by one reviewer (EY) with a sample (20%) taken and verified by a second reviewer (PB). After determining which papers to include in the review, the data was synthesised and components of the interventions and the research methods of the studies were identified (Arksey & O’Malley, 2005). All information was charted in a word document including the authors, the date published, country, the research setting, the participants’ information, methods, the components of the interventions, outcomes, limitations and the knowledge gaps determined by the authors. After charting was completed, the information was interpreted. Later a summary table was developed (Table 1).

Table 1. Characteristics of the included research studies

(Systematic search)

A comprehensive research strategy was conducted using the following databases: Ebscohost, Eric, Science Direct, ProQuest Education, Taylor & Francis Online, BEI, Zetoc,
Scopus, SSCI, JVIB, Citation Index: Social Science and Humanities, which were all data sources. ProQuest Dissertations & Theses: UK & Ireland, Conference proceedings, Google scholar, Open Grey, Theses Canada Portal, PSYC articles, and RNIB were used for grey literature. A hand search was applied to the reference list of full text articles.

**Inclusion Criteria**

(1) **Types of participants:** Included children (VI) who might have additional disabilities based on the International Classification of Diseases and Related Health problems, 10th edition WHO (2010) criteria. Their parents/guardians, educators or other service providers also took part in some studies. Studies included children aged 0 to 14 years old because support in a child’s early years and in the early school years are important in future learning and development (Gorey, 2001; King, 2014).

(2) **Types of studies:** Intervention based implementations for children (VI), parents/guardians or education professionals were included. Qualitative, quantitative and mixed method studies were selected.

(3) **Language:** Only articles in English were searched because of a language restriction. Studies written in other languages were excluded.

(4) **Time period:** Studies between 1980 and 2019 were reviewed. Research studies out of this time period were excluded. 1980 was selected as a start date because some distinctive ideas (e.g., inclusion and statementing) started to appear in the field of special education at that time and these ideas led to changes in practical
applications. For searching of the related databases, the terms used (Sandieson, 2013) can be seen in Table 2.

Table 2. Search terms

(Preferred location for the Table 2)

Quality appraisal

The Mixed Method Appraisal Tool (MMAT) version 2011 (Pluye et al., 2011) was used to appraise the methodological quality of the studies. The MMAT tool was selected because the research designs of the studies vary. This tool includes clearly divided sub-sections for qualitative, quantitative and mixed method research designs. Each sub-section includes questions to appraise a selected study. The overall quality score for each study can be reached by assessing different criteria about the research questions, analysis process, recruitment of participants, sampling strategy or complete outcome data. There are four items for qualitative, quantitative (randomised trials, quantitative non-randomised trials and quantitative descriptive) studies; and three items for mixed method studies. These criteria can be answered in ‘Yes, No or Can’t tell’. For each of the answers descriptors (*, **, *** or ****) can be used to represent the score. For example (*) descriptor means that one criterion was met, and (****) descriptor means that all criteria were met. The total score is divided into four to obtain a score for each article. The validity and reliability of the pilot appraisal tool was inspected by the developers (Pluye et al., 2011).
Results

As outlined in Figure 1, 6,802 papers were identified through the systematic scoping review. After screening the identified publications and removing duplications, 437 papers remained. From 437 papers, 18 studies from seven different countries (Germany (n=1), Italy (n=1), Netherlands (n=1), Turkey (n=1), USA (n=11), UK (n=1), Iran (n=1), and one non-specified) were included by taking the inclusion criteria into consideration (Figure1). The sample size of the studies varies (Table 1). The age of the sample size is between birth and 14 years old. The total sample size of the studies includes approximately 4,000 children (VI). Half of the reviewed studies (n=9, 50%) include children (VI) and additional disabilities. More than half of the studies (55%) were conducted between 1990 and 2010.

Figure 1. Flow diagram for systematic scoping review

(PREFERRED LOCATION FOR THE FIGURE 1)

*Sourced from the PRISMA Group (Moher, Liberati, Tetzlaff, & Altman, 2009)

Methodological quality

The methodological quality of the 18 studies varied. The lowest score was 25% and the highest score was 75%. Overall three studies were considered low and 15 considered average (Table 1). Lower scores were attributed to a lack of appropriate consideration being given to the researcher’s reflexivity (qualitative studies) and a lack of information on selection bias or a low response rate/outcome data in quantitative studies.
Barriers to the implementations

The existing studies reported some limitations that affected the outcomes of the interventions for children (VI). These limitations were grouped into three categories.

1. Lack of training for parents/guardians or professionals and lack of access to the information and services (n=6, 33.3%) (Behl, White, & Escobar, 1993; Dennison, 2001; Dikowski, 1995; Hill, Dodson-Burk, Hill, & Fox, 1995; Joffee, 1988; Klein, Van Hasselt, Trefelner, Sandstorm, & Brandt-Snyder, 1988).

A lack of training for parents/guardians or professionals and a lack of information about access to services are reported as factors which negatively affect the intervention outcomes. The training needs of professionals were identified as assessments, planning or modifications of the applications and understanding the impacts of visual impairment (Behl et al., 1993; Dikowski, 1995). Additionally, a lack of parental training was identified as an issue that hinders the delivery of appropriate care for children.

2. Lack of adaptive equipment (n=4, 22%) (Chen & Haney, 1999; Dennison, 2001; Dikowski, 1995; Joffee, 1988).

Equipment used in an intervention needs to be adapted to suit each participant. Adapted equipment helps to meet the learning or development needs of children (VI). The lack of adaptive equipment used in applications may prevent the effectiveness of intervention outcomes.
3. Complicating factors associated with the child’s primary condition (i.e. additional disabilities) \((n=4, 22\%)\) (Chen & Haney, 1999; Dale et al., 2019; Rowland & Schweigert, 2000; Skellenger & Hill, 1994) and absence of specialists in interventions \((n=5, 27.77\%)\) (Behl et al., 1993; Dennison, 2001; Dikowski, 1995; Hill et al., 1995; Klein et al., 1988).

Children with additional disabilities and those with complex health needs require additional support tailored according to their needs. However, as the studies highlight, the parents and the professionals faced some challenges while modifying the materials or the learning environments according to the personalised needs of children. Modification and adaptation of the materials or applications require the joint involvement of trained specialists and parents/guardians. Although the involvement of enough specialists in interventions is crucial, the involvement of trained specialists who have knowledge of diagnosis, health care assessment or evaluation is a reported challenge to existing applications (Behl et al., 1993; Chen & Haney, 1999; Rowland & Schweigert, 2000).

**Potentially beneficial implementation facilitators of the interventions**

This review has identified potentially beneficial practices to the implementation of interventions. Potentially beneficial practices reported by the authors of the articles are grouped into four categories: (1) sensory strategies (2) a family-centred approach, (3) in-service training, (4) routines-based activities. These four categories will be discussed below.

1. **Sensory strategies:** The reviewed studies emphasise the importance of applying visual impairment specific strategies while working with children. Sensory strategies can be
grouped into three broad categories: (a) communication practices, (b) tactile and auditory activities, (c) orientation and mobility.

(a) Communication practices
Slightly under half of the reviewed studies (n=7, 38.8%) emphasised that developing communication skills between children and adults can promote daily life functioning because it helps to meet children’s expressed needs and wants (Bregani et al., 1981; Bruce, 2002; Chen & Haney, 1999; Janssen et al., 2011; Klein, Van Hasselt, Trefelner, Sandstorm, & Brandt-Snyder, 1988; Rowland & Schweigert, 2000; Sarica et al., 2015). Communication practices most often took place within a structured intervention practice. The studies emphasise that personalised, and visual impairment specific practices, are best modified in accordance with the needs of children and their parents/guardians because this improves communication and interaction between parents/guardians and children (Bregani et al., 1981; Bruce, 2002; Chen & Haney, 1999; Janssen et al., 2011; Klein et al., 1988; Rowland & Schweigert, 2000; Sarica et al., 2015).

(b) Tactile and auditory activities
Less than one quarter of the studies (n=4, 22%) include tactile or auditory cues (i.e. sound making toys, reaching for or grasping sound making objects) (Beelmann & Brambring, 1998; Chen & Haney, 1999; Erickson et al., 2007; Joffee, 1988). These studies emphasise the benefits of providing adaptive tactile or auditory materials for children. Despite the different implementations, the research results outline that tactile and auditory cues might help children interact with their environment, encourage child independent mobility and increase communication between parents/guardians and children (Joffee, 1988; Chen & Haney, 1999; Erickson et al., 2007).
Several studies (n=3, 16.6%) focused on orientation and mobility skills through involving professionals who are experts in orientation and mobility (Beelmann & Brambring, 1998; Harley, Long, Merbler, Langley, & Wood, 1986; Joffee, 1988). In these studies, promoting orientation and mobility skills has been linked with the existence of orientation and mobility specialists in intervention. These studies report that integrating orientation and mobility within interventions with a particular focus on increasing the future mobility of children can be an effective strategy. The activities applied in reviewed studies vary according to the individualised needs of children, including locomotion skills, purposeful navigation, and orientation or mobility.

2. A family-centred approach: Within this review, 13 studies (72%) emphasise the importance of collaboration between parents/guardians and professionals (Beelmann & Brambring, 1998; Behl et al., 1993; Bregani et al., 1981; Chen & Haney, 1999; Dale et al., 2019; Dennison, 2001; Dikowski, 1995; Erickson et al., 2007; Harley et al., 1986; Janssen et al., 2011; Joffee, 1988; Klein et al., 1988; Sarica et al., 2015). A family-centred approach is an important outcome of these studies which revealed some valuable points.

Firstly, these 13 studies highlight the role of professional guidance which may provide valuable information about the progress of the child. These studies emphasise that professional guidance had a relevance for promoting parental involvement and family-professional collaboration. Additionally, giving families some opportunities to discuss their knowledge on the overall development process of their children was a helpful strategy in order to identify the needs of the child and the family. Accordingly, families had specific
knowledge on how their children learned. This kind of information helped professionals to be aware of the child’s cues in order to address the needs of the children.

3. In-service training: Half of the studies (n=9, 50%) involve teachers, early interventionists or intervention coaches to improve their competence in supporting children (VI) in the learning environments (Harley, 1986; Joffee, 1988; Skellenger and Hill, 1994; Dikowski, 1995; Chen & Haney, 1999; Rowland and Schweigert, 2000a; Dennison, 2001; Bruce, 2002; Erickson et al., 2007). Less than half of the studies (n=8, 44%) emphasise a gap in teacher and early interventionist training and a lack of knowledge by teachers about visual impairment specific issues. Interventions used to address these gaps were in-service training (Bruce, 2002; Chen & Haney, 1999; Dennison, 2001; Dikowski, 1995; Rowland & Schweigert, 2000a) or visual impairment specific trainings for teachers or early interventionists as a part of interventions (Harley et al., 1986; Joffee, 1988; Skellenger & Hill, 1994). Reviewed studies (n=8, 44%) applied in-service training as a way of collaborating with families or other professionals (Bruce, 2002; Deborah Chen & Haney, 1999; Dennison, 2001; Dikowski, 1995; Harley et al., 1986; Joffee, 1988; Rowland & Schweigert, 2000; Skellenger & Hill, 1994). The trainings were often reported as beneficial for education professionals or parents/guardians because the trainings increased access to information and maintained collaboration between health or education professionals and parents/guardians.

1. Routines-based activities: More half of the studies (n=11, 61%) conducted an intervention in the home settings of children with the aim of involving
parents/guardians in interventions (Beelmann & Brambring, 1998; Behl et al., 1993; Bregani et al., 1981; Chen & Haney, 1999; Dennison, 2001; Erickson et al., 2007; Harley, 1986; Hill et al., 1995; Joffee, 1988; Klein et al., 1988; Sarica et al., 2015). Six studies (33%) implemented routines-based activities (Behl et al., 1993; Bruce, 2002; Chen & Haney, 1999; Dikowski, 1995; Rowland & Schweigert, 2000; Sarica et al., 2015). The outcomes of implemented applications indicate that routines-based activities show some positive effects. For example, it can increase parents/guardians-child interaction, parents/guardians can learn to facilitate and adapt activities in their daily routines, or they can learn to identify promoters and hindrances in terms of adapting the environment according to their child’s. Additionally, parents/guardians can recognise their child’s communication cues which increase the quality of communication between family members and children.

**Intervention outcomes**

The reviewed studies reported the benefits of the intervention for children (VI), parents/guardians and educators. Potentially beneficial components of the interventions are orientation and mobility activities, professional guidance, home-based practices, in-service training, routine-based activities, family training and communication practices (Table 3).

**Table 3. The components of the reviewed interventions**

(Preferred location for the Table 3)

Of the reviewed studies, 15 of them (83.3%) reported benefits of the intervention for their participants in following areas:
Benefits for children

1. Positive outcomes on skill acquisition (Bregani et al., 1981; Hill et al., 1995; Rowland & Schweigert, 2000; Skellenger & Hill, 1994).
2. Communication development (Bruce, 2002; Chen & Haney, 1999; Janssen et al., 2011).
3. Increased independence (Chen & Haney, 1999; Rowland & Schweigert, 2000).
6. Enhanced parents/guardian-child interaction (Bregani et al., 1981; Janssen et al., 2011; Sarica et al., 2015).

Benefits for parents/guardians are reported as

2. Increased knowledge about visual impairments (Dikowski, 1995).
3. Increased knowledge on how to support and communicate with children more effectively (Chen & Haney, 1999; Dikowski, 1995; Sarica et al., 2015).
4. Increased knowledge on how to respond to the child’s cues (Chen & Haney, 1999; Sarica et al., 2015).
5. Reduced parental stress (Dale et al., 2019; Khooshab, Jahanbin, Ghadakpour, & Keshavarzi, 2016).

Benefits for teachers are reported as:

1. Increased knowledge on how to assist children (Hill et al., 1995)
Null effects of the interventions are also reported by the authors. Of the reviewed studies, eight of them (44.4%) report null, partially null and negative effects of the interventions or activities for their participants (Beelmann & Brambring, 1998; Behl, White, & Escobar, 1993; Chen & Haney, 1999; Dale et al., 2019; Harley et al., 1986; Janssen et al., 2011; Rowland & Schweigert, 2000; Skellenger & Hill, 1994).

Discussion

This scoping review sought to explore the barriers and facilitators of interventions carried out with children (VI), their parents/guardians or educators. This study is important in contributing knowledge by identifying the potentially beneficial components of existing interventions for this targeted group through systematic scoping methodology. The robust nature of the systematic review and quality assessment help to specify different components of the interventions. As identified, there is a scarcity of systematic scoping reviews in this targeted area.

The evidence from 18 reviewed studies indicates that the effectiveness of interventions for children (VI) requires a comprehensive approach in terms of adapting the environment and involving parents/guardians in the implementation process. Although implementation of different practices has been reported in 18 studies, some common barriers to and facilitators of approaches have emerged which can be seen below.

Key barriers to the approaches

A lack of knowledge about visual impairment, the complicating features of a child’s disability and the challenges parents/guardians face in accessing information are identified as barriers to the implementation of successful interventions. Similar issues are highlighted
in other studies where the subjects are children (VI) (Gal, Dyck, & Passmore, 2010; Kappen, 2017; Probst & Borders, 2017; Stearns, 2017; van den Broek, Janssen, van Ramshorst, & Deen, 2006). Within this review, half of the studies involve children (VI) and additional disabilities. However, few studies gave details regarding the needs of those with other disabilities in addition to visual impairment. This knowledge gap is addressed in other studies by considering the increasing number of this subgroup (Argyropoulos & Thymakis, 2014; Jones & Hensley-Maloney, 2015; McLinden & McCall, 2016; Salt & Sargent, 2014). As these publications highlight, the care and support techniques are diverse and the identification of the unique needs of this subgroup may require further research.

This review shows that the professionals’ role seems important in influencing the barriers experienced by children (VI) with or without additional disabilities. Therefore, the absence of specialists in interventions is revealed as a barrier in optimising positive research outcomes. The key challenges of scheduling an intervention are service coordination, organisation of the programmes and scheduling and involving certificated trainers (Beelmann & Brambring, 1998; Behl et al., 1993; Dikowski, 1995; Hill et al., 1995; Joffee, 1988; Sarica et al., 2015). Similarly, the results of the recent studies highlight the families’ concerns regarding a lack of professional support and access to the services (Barbieri et al., 2016; Ben-David & Nel, 2013; Geldenhuys & Wevers, 2013; Lupón, Armayones, & Cardona, 2018). However, fewer studies indicate that the satisfaction or dissatisfaction of the families regarding the services varied regarding differences in needs, economic well-being or parental knowledge on services (Pickard & Ingersoll, 2016; Robert, Leblanc, & Boyer, 2015). In several studies, the importance of individualised support to meet the needs of children (VI) is emphasised (Lang, Hintermair, & Sarimski,
A difficulty identified in implementing individualised practices for each child is the requirement for a carefully designed and well-organised long-term application. This issue may require a combination of different support strategies while studying with children (VI) and who has additional disabilities (Aitken, 2000; McLinden & McCall, 2016; Solebo & Rahi, 2014). Overall, the evidence provides valuable information in understanding what kind of intervention strategies were applied and what kind of strategies have worked.

**Key facilitators of the approaches**

The outcomes of this review show that a detailed and ongoing assessment of the intervention process is necessary for increasing potential benefits (Bregani et al., 1981; Dennison, 2001; Erickson et al., 2007; Hill et al., 1995; Rowland & Schweigert, 2000). It is emphasised that home visits, adaptive equipment and vision specific training for parents/guardians and professionals have the potential to optimise the benefits of the intervention outcomes. Similarly, the literature indicates the possible benefits of home visits on building relationships between participants and providers, monitoring progress and exploring participant experiences (Avellar et al., 2014; Paton, Grant, & Tsourtos, 2013). However, it has been suggested that more research is needed to understand the effects of home visits on research outcomes (Avellar et al., 2014; Paton et al., 2013; Peacock, Konrad, Watson, Nickel, & Muhajarine, 2013). Additionally, Peacock et al. (2013) argue that interventions which include home visits should be tailored to meet the participants’ needs to prevent unintended outcomes. Similar to the results of this review, training needs of parents or professionals is emphasised in the literature in order to develop
appropriate and effective skills to support children (VI) (Ben-David & Nel, 2013; Geldenhuys & Wevers, 2013).

The potentially beneficial practices of existing applications for children (VI) were mapped into four stages (Figure 2). These are: (1) a detailed assessment of participants’ needs, (2) the family-centred approach for promoting implementations of interventions, (3) feedback and suggestions provided by the participants, (4) revisiting the techniques and strategies after receiving participants’ feedback.

Figure 2. Mapping the outcomes of the studies: Potentially beneficial components of the interventions for children with visual impairments

(Preferred location for the Figure 2)

Strengths and limitations

This robust and comprehensive search has been conducted to identify the key components of existing interventions for children (VI), their families or education professionals. Additionally, the barriers to or facilitators of the strategies that have been addressed in the reviewed research studies were identified.

Although a systematic methodological framework is followed through the reviewing process, there are still some limitations. Firstly, a single reviewer interpreted the data and mapped the results which can result in reviewer selection bias. A relatively small number of studies were identified regarding the selection criteria of this review. No meta-analysis was conducted due to heterogeneity within the sample. Secondly, the methodological procedure of this review is based upon the framework of Arksey and
O’Malley (2005) and it does not reflect any other alternative approaches to the scoping review. Thirdly, as an inclusion criterion, all studies reviewed were only in English which is a language bias. As a result of this criterion some intervention studies that have been conducted with targeted populations published in languages other than English were excluded. This might limit the outcomes of this review.

To our knowledge, from the results of this review it is difficult to separate the impact of additional disabilities on the implementation of interventions for this population, and this situation should inform the identified strategies in future research. Limitations of the theoretical robustness of the articles identified a need for future research to put the emphasis on the broader implementation of interventions through a comprehensive theoretical framework.

**Future research**

The review results indicate that although a variety of practices are available, there is still a lack of information on the process of design and implementation of effective interventions. A lack of research evidence on details of the applications is evident on the implementation of strategies for children in primary school settings. This issue covers the determination of teachers’ needs in order to understand how educators possibly meet the needs of pupils with visual impairments and those with additional disabilities. Identifying these topics through a robust theoretical framework would make the issues clear as a few studies report that limitations in the intervention process may have occurred because of a lack of needs assessment and poor design (Harley et al., 1986; Joffee, 1988; Rowland & Schweigert, 2000). Overall, the scarcity of studies in the targeted research area, the complex nature of
interventions for children (VI), and the limited information provided about the design of interventions in identified studies were the main issues that appeared during the review process. It is expected that the detailed outcomes of this study will provide some ideas for future researchers and practitioners by considering the different components of the interventions for children (VI), their parents/guardians and educators before designing such interventions.

Conclusion

This review on interventions for children (VI), their families and education professionals identified some implementation barriers and facilitators to existing strategies. The identified implementation facilitators were sensory strategies, a family-centred approach, in-service training and routines-based activities. These facilitators were reported as factors which may optimise the positive outcomes of the practices, particularly in the development and progress of children (VI). These factors can also increase parental involvement in interventions. The identified barriers were a lack of adaptive equipment, training for parents/guardians and professionals, complicating factors associated with a child’s disability and an absence of specialists in interventions. As far as could be identified in this review, the diversity of this population and the scarcity of research on this group resulted in a lack of research evidence. This makes it difficult to identify effective strategies within interventions for different age groups of children (VI). The results of this review highlight the importance of a personalised needs assessment before carrying out an intervention. Additionally, the involvement of carefully designed and tested strategies in interventions can optimise positive outcomes for future practices carried out by health and care or
education services. In addition, it emerged that the identification of the needs of children (VI) and additional disabilities should be considered in order to develop effective support strategies for this group.

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### Table 1. Characteristics of the included research studies

<table>
<thead>
<tr>
<th>No</th>
<th>Study (Origin)</th>
<th>Sample</th>
<th>Method</th>
<th>Outcomes</th>
<th>Diagnosis</th>
<th>Quality appraisal (%)</th>
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<tbody>
<tr>
<td>1</td>
<td>(Harley et al., 1986) USA</td>
<td>Infants (n=22), parents, teachers or nurses</td>
<td>Experimental design</td>
<td>Positive outcomes in cognitive, movement and touch areas</td>
<td>Visual impairment and additional disabilities</td>
<td>75</td>
</tr>
<tr>
<td>2</td>
<td>(Erickson et al., 2007) USA</td>
<td>Children (n=3) and their families, early interventionists (n=2)</td>
<td>Qualitative</td>
<td>Positive outcomes highlight the role of early interventionists</td>
<td>Visual impairment</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>(Skellenger &amp; Hill, 1994) USA</td>
<td>Children (n=3), their teachers</td>
<td>Multiple probe technique</td>
<td>Positive outcomes in increasing play behaviour</td>
<td>Visual impairment</td>
<td>75</td>
</tr>
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<td>4</td>
<td>(Rowland &amp; Schweigert, 2000) USA</td>
<td>Children (n=12), project staff</td>
<td>Mixed method</td>
<td>Positive outcomes in communication and social interaction skills</td>
<td>Deaf-blindness</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>(Joffee, 1988) USA</td>
<td>Infants (n=20) and their caregivers, occupational therapist, physical therapist, early intervention teacher,</td>
<td>Qualitative</td>
<td>Positive outcomes in foundation needed for the future development of mobility</td>
<td>Visual impairment</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>(Dikowski, 1995) USA</td>
<td>Children (n=50), and their parents, teachers, psychologists and other professionals</td>
<td>Quantitative</td>
<td>Increased parental knowledge about visual impairments</td>
<td>Visual impairment</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>(Sarica et al., 2015) Turkey</td>
<td>Children (n=2), their caregivers</td>
<td>Action research</td>
<td>Positive outcomes in maternal interactional behaviours and children’s interactional behaviours</td>
<td>Visual impairment</td>
<td>75</td>
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(Continued)
<table>
<thead>
<tr>
<th></th>
<th>Study Authors &amp; Year</th>
<th>Study Details</th>
<th>Study Design</th>
<th>Findings</th>
<th>Disability</th>
<th></th>
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<tr>
<td>8</td>
<td>(Deborah Chen &amp; Haney, 1999) USA</td>
<td>Infants (n=25) and their caregivers, early interventionists</td>
<td>Qualitative</td>
<td>Increased parental knowledge about visual impairments and communicative interaction</td>
<td>Deaf-blindness</td>
<td>75</td>
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<td>9</td>
<td>(Janssen et al., 2011) Netherlands</td>
<td>Child (n=1), caregiver and interaction coach</td>
<td>Qualitative</td>
<td>Positive outcomes in caregiver behaviour</td>
<td>Visual impairment and additional disabilities</td>
<td>50</td>
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<tr>
<td>10</td>
<td>(Beelmann &amp; Brambring, 1998) Germany</td>
<td>Children (n=10), their parents, psychologists (n=3), special education teacher (n=1)</td>
<td>Case control</td>
<td>Positive outcomes in development, improved orientation and mobility performance</td>
<td>Visual impairment</td>
<td>75</td>
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<tr>
<td>11</td>
<td>(Bregani et al., 1981) Italy</td>
<td>Children (n=8), their parents, interventionists</td>
<td>Experimental</td>
<td>Positive outcomes of parental training</td>
<td>Visual impairment</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>(Bruce, 2002) USA</td>
<td>Children (n=3), teachers (n=2)</td>
<td>Qualitative</td>
<td>Positive outcomes regarding service training</td>
<td>Deaf-blindness</td>
<td>75</td>
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<td>13</td>
<td>(Klein, Van Hasselt, Trefelner, Sandstorm, &amp; Brandt-Snyder, 1988) USA</td>
<td>Children (n=22) and their caregivers, trainers</td>
<td>Experimental design</td>
<td>Actual results were not determined but the intervention is targeted as successful</td>
<td>Visual impairment and additional disabilities</td>
<td>25</td>
</tr>
<tr>
<td>14</td>
<td>(Hill et al., 1995) Non-determined</td>
<td>Child (n=1), observer</td>
<td>Experimental design</td>
<td>Partially successful. Positive outcomes in reaching out and locating an object</td>
<td>Visual impairment and additional disabilities</td>
<td>75</td>
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<tr>
<td>15</td>
<td>(Behl et al., 1993) USA</td>
<td>Children (n=35) and their caregivers</td>
<td>Randomised control trial</td>
<td>The results highlight the requirement of more comprehensive intervention for infants and toddlers</td>
<td>Visual impairment</td>
<td>50</td>
</tr>
<tr>
<td>16</td>
<td>(Dennison, 2001) USA</td>
<td>1,334 professionals who made an impact on 3,455 infants’ life</td>
<td>Mixed method</td>
<td>Effectiveness of the project (in-service training model) is reported</td>
<td>Visual impairment with or without additional disabilities</td>
<td>75</td>
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</table>

Table 1. Continued
Table 2. Search terms

Population
(Child* OR “early child education*” OR “primary education” OR “Primary class*” OR “Primary school**")
Issue
(“vis* impair*” OR “vision disorder*” OR “vision-impair*” OR “vision deficiency” OR blind* OR “vision loss” OR “vision problem*” OR “vision difficult*” OR “impaired vision” OR “partial vision” OR “vision deficiency” OR “partial sight*” OR “sight loss” OR “low vision")

Table 3. The components of the reviewed interventions

<table>
<thead>
<tr>
<th>Components</th>
<th>Reviewed studies</th>
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<tr>
<td>Cortical visual impairments</td>
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<tr>
<td>Category</td>
<td>References</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Orientation and mobility</td>
<td>Harley et al., 1986; Joffee, 1988</td>
</tr>
<tr>
<td>Collaboration between families and professionals</td>
<td>Beelmann &amp; Brambring, 1998; Behl et al., 1993; Chen &amp; Haney, 1999; Dale et al., 2019; Dennison, 2001; Dikowski, 1995; Erickson et al., 2007; Harley et al., 1986; Janssen et al., 2011; Joffee, 1988; Klein et al., 1988; Sarica et al., 2015</td>
</tr>
<tr>
<td>Professional guidance</td>
<td>Behl et al., 1993; Bregani et al., 1981; Bruce, 2002; Erickson et al., 2007; Harley et al., 1986; Klein et al., 1988</td>
</tr>
<tr>
<td>Home-based practices</td>
<td>Beelmann &amp; Brambring, 1998; Behl et al., 1993; Bregani et al., 1981; Chen &amp; Haney, 1999; Dale et al., 2019; Dennison, 2001; Harley et al., 1986; Joffee, 1988; Khooshab et al., 2016; Klein et al., 1988; Sarica et al., 2015; Skellenger &amp; Hill, 1994</td>
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<td>In-service training</td>
<td>Bruce, 2002; Chen &amp; Haney, 1999; Dennison, 2001; Dikowski, 1995; Harley et al., 1986; Joffée, 1988; Rowland &amp; Schweigert, 2000; Skellenger &amp; Hill, 1994</td>
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<td>Routine-based activities</td>
<td>Bruce, 2002; Dikowski, 1995; Rowland &amp; Schweigert, 2000</td>
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<td>Family training</td>
<td>Chen &amp; Haney, 1999; Dale et al., 2019; Harley et al., 1986; Joffée, 1988; Sarica et al., 2015</td>
</tr>
<tr>
<td>Communication practices</td>
<td>Bregani et al., 1981; Chen &amp; Haney, 1999; Janssen et al., 2011; Klein et al., 1988; Rowland &amp; Schweigert, 2000; Sarica et al., 2015</td>
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</tbody>
</table>