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

4

5 **Word count:** 4,947

6

7 **ABSTRACT**

8

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

15 A systematic scoping search of peer-reviewed literature (including grey literature)
16 was conducted from 15 June 2016 to 7 August 2016 and 2 May 2019 to 5 May 2019. Initial
17 searches identified 6,802 papers with 15 meeting the inclusion criteria. Three additional
18 articles were identified through hand searching giving a final total of 18 included studies.
19 The methodological quality score of the studies was variable with 61% scored in the
20 average quality range. Sensory strategies, a family centred approach, in-service training
21 and routines-based activities were identified as implementation facilitators. Barriers were
22 a lack of adaptive equipment and training for parents and professionals, complicating
23 factors associated with the child's disability and an absence of specialists in interventions.

24 Effective intervention strategies differ for this targeted population which requires
25 individualised applications associated with teacher and parent/guardian training. For health
26 or education professionals who work with children with visual impairments, the outcomes
27 of this review suggest that a detailed assessment and identification of the individualised
28 needs of children and their families, coupled with carefully designed and tested support
29 practices to meet their individualised needs as well as promoting integrated working
30 between health and care services, can optimise the positive implications for future practice.
31 Along with this, future consideration should be given to the identification of the needs of
32 children with visual impairments and additional disabilities in order to facilitate the
33 adjustment of intervention strategies for this group.

34 **KEYWORDS**

35 Children, intervention, carers, practice, visual impairment

36 **Introduction**

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

46 & Roe, 1998). Yet the research evidence regarding the most effective and beneficial
47 approaches in this area is scarce.

48 As the uniqueness and complexity of a child's conditions makes it difficult to
49 accurately address the needs of children, most often interventions take place to provide a
50 multidisciplinary assessment and support for this population. However, previously
51 conducted reviews on interventions for children with visual impairments (children (VI))
52 report that the research evidence is still limited to a generalised intervention model for this
53 population. This is because existing studies have been carried out with a heterogeneous
54 sample and small sample size which makes it difficult to identify a single intervention
55 model for this population (Pérez-Pereira & Conti-Ramsden, 1999; van den Broek et al.,
56 2017).

57 **Interventions for children with visual impairments**

58 Support for children (VI) and their families can be provided through interventions in the
59 child's life at multiple stages. Most often support at an early age is provided through early
60 intervention services by considering the critical period of early life development (Celeste
61 & Kobal Grum, 2010; Chen, 2014; Fraiberg, 1977; Hatfield & McCutchen, 2008;
62 McLinden & McCall, 2016; Pérez-Pereira & Conti-Ramsden, 1999; van den Broek et al.,
63 2017).

64 Early intervention services have a comprehensive structure to minimize
65 developmental delay through systematic practices and family support is an integral part of
66 these services (Celeste & Kobal Grum, 2010; Ely, Gullifor, & Hollinshead, 2017; Kobal
67 Grum & Kobal, 2010; Ross, 2017; Wiley, Parnell, & Belhorn, 2016). Early intervention
68 for children (VI) aims to optimize residual light perception and promote development,

69 growth and independent living, as well as provide support for families and minimize the
70 cumulative effects of additional disabilities (Allen, 2011; Brambring, Rauh, & Beelmann,
71 1996; Chen, 2014; Fazzi, Signorini, Bova, Ondeï, & Bianchi, 2005). Early intervention and
72 support strategies additionally promote access to education and healthcare services (Allen,
73 2011; Brambring et al., 1996; Chen, 2014).

74 For children (VI), accessing education is as important as access to health care
75 services in terms of promoting lifelong learning and progress. However, children (VI) and
76 their families still face difficulties in getting access to education services and the delivery
77 of essential learning materials (WHO, 2012b). Specifically, school age interventions aim
78 to reduce these potential risks relating to access to education. School interventions provide
79 multi-layered support in different skill areas such as communication and socio-emotional
80 skills, fine motor and gross motor skills, cognitive skills and orientation and mobility
81 (Chen, 2014; Stearns, 2017). The implementation of interventions can differ in order to
82 meet the individualised needs of children by personalising the teaching methods (Chen,
83 2014; Wiley et al., 2016).

84 Interventions for school-age children can involve specialists, and health and
85 education services, by incorporating schools to increase the effectiveness of interventions
86 (Chen, 2014; Stearns, 2017). Along with this, if qualified professionals (such as qualified
87 teachers of children with visual impairments (QTVI) or orientation and mobility
88 specialists) are involved in interventions, they can provide an additional contribution and
89 provide further assistance for children and school personnel (Bruce, Ferrell, & Luckner,
90 2016; Opie, 2018). The comprehensive structure of school interventions can promote
91 access to information, modification of the learning environment, or adaptation of materials

92 alongside a core curriculum (Brambring et al., 1996; Chen, 2014; Fazzi et al., 2005).
93 Therefore, the consideration of different variables in implementing interventions, such as
94 types of primary diagnosis, coexisting disabilities and the nature and degree of vision, can
95 help to utilise adaptive support strategies (Correa-Torres & Bowen, 2016; Lewis & Collis,
96 1997; van den Broek et al., 2017).

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

106

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

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

112

113 **Methods**

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

129

130 **Table 1.** Characteristics of the included research studies

131 *(Preferred location for the Table 1)*

132

133 ***Systematic search***

134 A comprehensive research strategy was conducted using the following databases:
135 Ebscohost, Eric, Science Direct, ProQuest Education, Taylor & Francis Online, BEI, Zetoc,

136 Scopus, SSCI, JVIB, CitaTION Index: Social Science and Humanities, which were all data
137 sources. ProQuest Dissertations & Theses: UK & Ireland, Conference proceedings, Google
138 scholar, Open Grey, Theses Canada Portal, PSYC articles, and RNIB were used for grey
139 literature. A hand search was applied to the reference list of full text articles.

140

141 ***Inclusion Criteria***

142 (1) **Types of participants:** Included children (VI) who might have additional
143 disabilities based on the International Classification of Diseases and Related Health
144 problems, 10th edition WHO (2010) criteria. Their parents/guardians, educators or
145 other service providers also took part in some studies. Studies included children
146 aged 0 to 14 years old because support in a child's early years and in the early
147 school years are important in future learning and development (Gorey, 2001; King,
148 2014).

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

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

154 (4) **Time period:** Studies between 1980 and 2019 were reviewed. Research studies out
155 of this time period were excluded. 1980 was selected as a start date because some
156 distinctive ideas (e.g., inclusion and statementing) started to appear in the field of
157 special education at that time and these ideas led to changes in practical

158 applications. For searching of the related databases, the terms used (Sandieson,
159 2013) can be seen in Table 2.

160

161 **Table 2.** Search terms

162 *(Preferred location for the Table 2)*

163

164 ***Quality appraisal***

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

179

180 **Results**

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

190

191 **Figure 1.** Flow diagram for systematic scoping review

192 *(Preferred location for the Figure 1)*

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

194

195 ***Methodological quality***

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

201

202 *Barriers to the implementations*

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

205

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

210 A lack of training for parents/guardians or professionals and a lack of information about
211 access to services are reported as factors which negatively affect the intervention outcomes.

212 The training needs of professionals were identified as assessments, planning or
213 modifications of the applications and understanding the impacts of visual impairment (Behl
214 et al., 1993; Dikowski, 1995). Additionally, a lack of parental training was identified as an
215 issue that hinders the delivery of appropriate care for children.

216

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

219 Equipment used in an intervention needs to be adapted to suit each participant. Adapted
220 equipment helps to meet the learning or development needs of children (VI). The lack of
221 adaptive equipment used in applications may prevent the effectiveness of intervention
222 outcomes.

223

224 3. Complicating factors associated with the child's primary condition (i.e. additional
225 disabilities) (n=4, 22%) (Chen & Haney, 1999; Dale et al., 2019; Rowland & Schweigert,
226 2000; Skellenger & Hill, 1994) and absence of specialists in interventions (n=5, 27.77%)
227 (Behl et al., 1993; Dennison, 2001; Dikowski, 1995; Hill et al., 1995; Klein et al., 1988).
228 Children with additional disabilities and those with complex health needs require additional
229 support tailored according to their needs. However, as the studies highlight, the parents and
230 the professionals faced some challenges while modifying the materials or the learning
231 environments according to the personalised needs of children. Modification and adaptation
232 of the materials or applications require the joint involvement of trained specialists and
233 parents/guardians. Although the involvement of enough specialists in interventions is
234 crucial, the involvement of trained specialists who have knowledge of diagnosis, health
235 care assessment or evaluation is a reported challenge to existing applications (Behl et al.,
236 1993; Chen & Haney, 1999; Rowland & Schweigert, 2000).

237

238 *Potentially beneficial implementation facilitators of the interventions*

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

244

245 **1. Sensory strategies:** The reviewed studies emphasise the importance of applying visual
246 impairment specific strategies while working with children. Sensory strategies can be

247 grouped into three broad categories: (a) communication practices, (b) tactile and auditory
248 activities, (c) orientation and mobility.

249 (a) Communication practices

250 Slightly under half of the reviewed studies (n=7, 38.8%) emphasised that developing
251 communication skills between children and adults can promote daily life functioning
252 because it helps to meet children's expressed needs and wants (Bregani et al., 1981; Bruce,
253 2002; Chen & Haney, 1999; Janssen et al., 2011; Klein, Van Hasselt, Trefelner, Sandstorm,
254 & Brandt-Snyder, 1988; Rowland & Schweigert, 2000; Sarica et al., 2015).
255 Communication practices most often took place within a structured intervention practice.
256 The studies emphasise that personalised, and visual impairment specific practices, are best
257 modified in accordance with the needs of children and their parents/guardians because this
258 improves communication and interaction between parents/guardians and children (Bregani
259 et al., 1981; Bruce, 2002; Chen & Haney, 1999; Janssen et al., 2011; Klein et al., 1988;
260 Rowland & Schweigert, 2000; Sarica et al., 2015).

261 (b) Tactile and auditory activities

262 Less than one quarter of the studies (n=4, 22%) include tactile or auditory cues (i.e. sound
263 making toys, reaching for or grasping sound making objects) (Beelmann & Brambring,
264 1998; Chen & Haney, 1999; Erickson et al., 2007; Joffe, 1988). These studies emphasise
265 the benefits of providing adaptive tactile or auditory materials for children. Despite the
266 different implementations, the research results outline that tactile and auditory cues might
267 help children interact with their environment, encourage child independent mobility and
268 increase communication between parents/guardians and children (Joffe, 1988; Chen &
269 Haney, 1999; Erickson et al., 2007).

270 (c) Orientation and mobility

271 Several studies (n=3, 16.6%) focused on orientation and mobility skills through involving
272 professionals who are experts in orientation and mobility (Beelmann & Brambring, 1998;
273 Harley, Long, Merbler, Langley, & Wood, 1986; Joffee, 1988). In these studies, promoting
274 orientation and mobility skills has been linked with the existence of orientation and
275 mobility specialists in intervention.-These studies report that integrating orientation and
276 mobility within interventions with a particular focus on increasing the future mobility of
277 children can be an effective strategy. The activities applied in reviewed studies vary
278 according to the individualised needs of children, including locomotion skills, purposeful
279 navigation, and orientation or mobility.

280

281 **2. A family-centred approach:** Within this review, 13 studies (72%) emphasise the
282 importance of collaboration between parents/guardians and professionals (Beelmann &
283 Brambring, 1998; Behl et al., 1993; Bregani et al., 1981; Chen & Haney, 1999; Dale et al.,
284 2019; Dennison, 2001; Dikowski, 1995; Erickson et al., 2007; Harley et al., 1986; Janssen
285 et al., 2011; Joffee, 1988; Klein et al., 1988; Sarica et al., 2015). A family-centred approach
286 is an important outcome of these studies which revealed some valuable points.

287 Firstly, these 13 studies highlight the role of professional guidance which may
288 provide valuable information about the progress of the child. These studies emphasise that
289 professional guidance had a relevance for promoting parental involvement and family-
290 professional collaboration. Additionally, giving families some opportunities to discuss
291 their knowledge on the overall development process of their children was a helpful strategy
292 in order to identify the needs of the child and the family. Accordingly, families had specific

293 knowledge on how their children learned. This kind of information helped professionals to
294 be aware of the child's cues in order to address the needs of the children.

295

296 **3. In-service training:** Half of the studies (n=9, 50 %) involve teachers, early
297 interventionists or intervention coaches to improve their competence in supporting children
298 (VI) in the learning environments (Harley, 1986; Joffee, 1988; Skellenger and Hill, 1994;
299 Dikowski, 1995; Chen & Haney, 1999; Rowland and Schweigert, 2000a; Dennison, 2001;
300 Bruce, 2002; Erickson *et al.*, 2007). Less than half of the studies (n=8, 44%) emphasise a
301 gap in teacher and early interventionist training and a lack of knowledge by teachers about
302 visual impairment specific issues. Interventions used to address these gaps were in-service
303 training (Bruce, 2002; Chen & Haney, 1999; Dennison, 2001; Dikowski, 1995; Rowland
304 & Schweigert, 2000a) or visual impairment specific trainings for teachers or early
305 interventionists as a part of interventions (Harley *et al.*, 1986; Joffee, 1988; Skellenger &
306 Hill, 1994). Reviewed studies (n=8, 44%) applied in-service training as a way of
307 collaborating with families or other professionals (Bruce, 2002; Deborah Chen & Haney,
308 1999; Dennison, 2001; Dikowski, 1995; Harley *et al.*, 1986; Joffee, 1988; Rowland &
309 Schweigert, 2000; Skellenger & Hill, 1994). The trainings were often reported as beneficial
310 for education professionals or parents/guardians because the trainings increased access to
311 information and maintained collaboration between health or education professionals and
312 parents/guardians.

313

314 1. **Routines-based activities:** More half of the studies (n=11, 61%) conducted an
315 intervention in the home settings of children with the aim of involving

316 parents/guardians in interventions (Beelmann & Brambring, 1998; Behl et al.,
317 1993; Bregani et al., 1981; Chen & Haney, 1999; Dennison, 2001; Erickson et al.,
318 2007; Harley, 1986; Hill et al., 1995; Joffe, 1988; Klein et al., 1988; Sarica et al.,
319 2015). Six studies (33%) implemented routines-based activities (Behl et al., 1993;
320 Bruce, 2002; Chen & Haney, 1999; Dikowski, 1995; Rowland & Schweigert, 2000;
321 Sarica et al., 2015). The outcomes of implemented applications indicate that
322 routines-based activities show some positive effects. For example, it can increase
323 parents/guardians-child interaction, parents/guardians can learn to facilitate and
324 adapt activities in their daily routines, or they can learn to identify promoters and
325 hindrances in terms of adapting the environment according to their child's.
326 Additionally, parents/guardians can recognise their child's communication cues
327 which increase the quality of communication between family members and
328 children.

329 *Intervention outcomes*

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

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

335 *(Preferred location for the Table 3)*

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

338

339 Benefits for children

- 340 1. Positive outcomes on skill acquisition (Bregani et al., 1981; Hill et al., 1995;
341 Rowland & Schweigert, 2000; Skellenger & Hill, 1994).
- 342 2. Communication development (Bruce, 2002; Chen & Haney, 1999; Janssen et al.,
343 2011).
- 344 3. Increased independence (Chen & Haney, 1999; Rowland & Schweigert, 2000).
- 345 4. Enhanced orientation and mobility performance (Beelmann & Brambring, 1998;
346 Harley et al., 1986).
- 347 5. Development of fine and gross motor skills (Beelmann & Brambring, 1998).
- 348 6. Enhanced parents/guardian-child interaction (Bregani et al., 1981; Janssen et al.,
349 2011; Sarica et al., 2015).

350 Benefits for parents/guardians are reported as

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

358 Benefits for teachers are reported as:

- 359 1. Increased knowledge on how to assist children (Hill et al., 1995)

360 Null effects of the interventions are also reported by the authors. Of the reviewed studies
361 eight of them (44.4%) report null, partially null and negative effects of the interventions or
362 activities for their participants (Beelmann & Brambring, 1998; Behl, White, & Escobar,
363 1993; Chen & Haney, 1999; Dale et al., 2019; Harley et al., 1986; Janssen et al., 2011;
364 Rowland & Schweigert, 2000; Skellenger & Hill, 1994).

365 **Discussion**

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

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

378

379 ***Key barriers to the approaches***

380 A lack of knowledge about visual impairment, the complicating features of a child's
381 disability and the challenges parents/guardians face in accessing information are identified
382 as barriers to the implementation of successful interventions. Similar issues are highlighted

383 in other studies where the subjects are children (VI) (Gal, Dyck, & Passmore, 2010;
384 Kappen, 2017; Probst & Borders, 2017; Stearns, 2017; van den Broek, Janssen, van
385 Ramshorst, & Deen, 2006). Within this review, half of the studies involve children (VI)
386 and additional disabilities. However, few studies gave details regarding the needs of those
387 with other disabilities in addition to visual impairment. This knowledge gap is addressed
388 in other studies by considering the increasing number of this subgroup (Argyropoulos &
389 Thymakis, 2014; Jones & Hensley-Maloney, 2015; McLinden & McCall, 2016; Salt &
390 Sargent, 2014). As these publications highlight, the care and support techniques are diverse
391 and the identification of the unique needs of this subgroup may require further research.

392 This review shows that the professionals' role seems important in influencing the
393 barriers experienced by children (VI) with or without additional disabilities. Therefore, the
394 absence of specialists in interventions is revealed as a barrier in optimising positive
395 research outcomes. The key challenges of scheduling an intervention are service
396 coordination, organisation of the programmes and scheduling and involving certificated
397 trainers (Beelmann & Brambring, 1998; Behl et al., 1993; Dikowski, 1995; Hill et al., 1995;
398 Joffe, 1988; Sarica et al., 2015). Similarly, the results of the recent studies highlight the
399 families' concerns regarding a lack of professional support and access to the services
400 (Barbieri et al., 2016; Ben-David & Nel, 2013; Geldenhuys & Wevers, 2013; Lupón,
401 Armayones, & Cardona, 2018). However, fewer studies indicate that the satisfaction or
402 dissatisfaction of the families regarding the services varied regarding differences in needs,
403 economic well-being or parental knowledge on services (Pickard & Ingersoll, 2016;
404 Robert, Leblanc, & Boyer, 2015). In several studies, the importance of individualised
405 support to meet the needs of children (VI) is emphasised (Lang, Hintermair, & Sarimski,

406 2017; Lupón et al., 2018; Oulton, Sell, Kerry, & Gibson, 2015; Roe, 2008). A difficulty
407 identified in implementing individualised practices for each child is the requirement for a
408 carefully designed and well-organised long-term application. This issue may require a
409 combination of different support strategies while studying with children (VI) and who has
410 additional disabilities (Aitken, 2000; McLinden & McCall, 2016; Solebo & Rahi, 2014).
411 Overall, the evidence provides valuable information in understanding what kind of
412 intervention strategies were applied and what kind of strategies have worked.

413 *Key facilitators of the approaches*

414 The outcomes of this review show that a detailed and ongoing assessment of the
415 intervention process is necessary for increasing potential benefits (Bregani et al., 1981;
416 Dennison, 2001; Erickson et al., 2007; Hill et al., 1995; Rowland & Schweigert, 2000). It
417 is emphasised that home visits, adaptive equipment and vision specific training for
418 parents/guardians and professionals have the potential to optimise the benefits of the
419 intervention outcomes. Similarly, the literature indicates the possible benefits of home
420 visits on building relationships between participants and providers, monitoring progress
421 and exploring participant experiences (Avellar et al., 2014; Paton, Grant, & Tsourtos,
422 2013). However, it has been suggested that more research is needed to understand the
423 effects of home visits on research outcomes (Avellar et al., 2014; Paton et al., 2013;
424 Peacock, Konrad, Watson, Nickel, & Muhajarine, 2013). Additionally, Peacock et al.
425 (2013) argue that interventions which include home visits should be tailored to meet the
426 participants' needs to prevent unintended outcomes. Similar to the results of this review,
427 training needs of parents or professionals is emphasised in the literature in order to develop

428 appropriate and effective skills to support children (VI) (Ben-David & Nel, 2013;
429 Geldenhuys & Wevers, 2013).

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

435

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

438 *(Preferred location for the Figure 2)*

439

440 **Strengths and limitations**

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

445 Although a systematic methodological framework is followed through the
446 reviewing process, there are still some limitations. Firstly, a single reviewer interpreted the
447 data and mapped the results which can result in reviewer selection bias. A relatively small
448 number of studies were identified regarding the selection criteria of this review. No meta-
449 analysis was conducted due to heterogeneity within the sample. Secondly, the
450 methodological procedure of this review is based upon the framework of Arksey and

451 O'Malley (2005) and it does not reflect any other alternative approaches to the scoping
452 review. Thirdly, as an inclusion criterion, all studies reviewed were only in English which
453 is a language bias. As a result of this criterion some intervention studies that have been
454 conducted with targeted populations published in languages other than English were
455 excluded. This might limit the outcomes of this review.

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

462

463 **Future research**

464 The review results indicate that although a variety of practices are available, there is still a
465 lack of information on the process of design and implementation of effective interventions.
466 A lack of research evidence on details of the applications is evident on the implementation
467 of strategies for children in primary school settings. This issue covers the determination of
468 teachers' needs in order to understand how educators possibly meet the needs of pupils
469 with visual impairments and those with additional disabilities. Identifying these topics
470 through a robust theoretical framework would make the issues clear as a few studies report
471 that limitations in the intervention process may have occurred because of a lack of needs
472 assessment and poor design (Harley et al., 1986; Joffe, 1988; Rowland & Schweigert,
473 2000). Overall, the scarcity of studies in the targeted research area, the complex nature of

474 interventions for children (VI), and the limited information provided about the design of
475 interventions in identified studies were the main issues that appeared during the review
476 process. It is expected that the detailed outcomes of this study will provide some ideas for
477 future researchers and practitioners by considering the different components of the
478 interventions for children (VI), their parents/guardians and educators before designing such
479 interventions.

480

481 **Conclusion**

482 This review on interventions for children (VI), their families and education professionals
483 identified some implementation barriers and facilitators to existing strategies. The
484 identified implementation facilitators were sensory strategies, a family-centred approach,
485 in-service training and routines-based activities. These facilitators were reported as factors
486 which may optimise the positive outcomes of the practices, particularly in the development
487 and progress of children (VI). These factors can also increase parental involvement in
488 interventions. The identified barriers were a lack of adaptive equipment, training for
489 parents/guardians and professionals, complicating factors associated with a child's
490 disability and an absence of specialists in interventions. As far as could be identified in this
491 review, the diversity of this population and the scarcity of research on this group resulted
492 in a lack of research evidence. This makes it difficult to identify effective strategies within
493 interventions for different age groups of children (VI). The results of this review highlight
494 the importance of a personalised needs assessment before carrying out an intervention.
495 Additionally, the involvement of carefully designed and tested strategies in interventions
496 can optimise positive outcomes for future practices carried out by health and care or

497 education services. In addition, it emerged that the identification of the needs of children
498 (VI) and additional disabilities should be considered in order to develop effective support
499 strategies for this group.

500

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731 **Table 1.** Characteristics of the included research studies

No	Study (Origin)	Sample	Method	Outcomes	Diagnosis	Quality appraisal (%)
1	(Harley et al., 1986) USA	Infants (n=22), parents, teachers or nurses	Experimental design	Positive outcomes in cognitive, movement and touch areas	Visual impairment and additional disabilities	75
2	(Erickson et al., 2007) USA	Children (n=3) and their families, early interventionists (n=2)	Qualitative	Positive outcomes highlight the role of early interventionists	Visual impairment	75
3	(Skellenger & Hill, 1994) USA	Children (n=3), their teachers	Multiple probe technique	Positive outcomes in increasing play behaviour	Visual impairment	75
4	(Rowland & Schweigert, 2000) USA	Children (n=12), project staff	Mixed method	Positive outcomes in communication and social interaction skills	Deaf -blindness	25
5	(Joffee, 1988) USA	Infants (n=20) and their caregivers, occupational therapist, physical therapist, early intervention teacher,	Qualitative	Positive outcomes in foundation needed for the future development of mobility	Visual impairment	25
6	(Dikowski, 1995) USA	Children (n=50), and their parents, teachers, psychologists and other professionals	Quantitative	Increased parental knowledge about visual impairments	Visual impairment	50
7	(Sarica et al., 2015) Turkey	Children (n=2), their caregivers	Action research	Positive outcomes in maternal interactional behaviours and children's interactional behaviours	Visual impairment	75

732 (Continued)

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734 **Table 1.** Continued

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8	(Deborah Chen & Haney, 1999) USA	Infants (n=25) and their caregivers, early interventionists	Qualitative	Increased parental knowledge about visual impairments and communicative interaction	Deaf-blindness	75
9	(Janssen et al., 2011) Netherlands	Child (n=1), caregiver and interaction coach	Qualitative	Positive outcomes in caregiver behaviour	Visual impairment and additional disabilities	50
10	(Beelmann & Brambring, 1998) Germany	Children (n=10), their parents, psychologists (n=3), special education teacher (n=1)	Case control	Positive outcomes in development, improved orientation and mobility performance	Visual impairment	75
11	(Bregani et al., 1981) Italy	Children (n=8), their parents, interventionists	Experimental	Positive outcomes of parental training	Visual impairment	50
12	(Bruce, 2002) USA	Children (n=3), teachers (n=2)	Qualitative	Positive outcomes regarding service training	Deaf-blindness	75
13	(Klein, Van Hasselt, Trefelner, Sandstorm, & Brandt-Snyder, 1988) USA	Children (n=22) and their caregivers, trainers	Experimental design	Actual results were not determined but the intervention is targeted as successful	Visual impairment and additional disabilities	25
14	(Hill et al., 1995) Non-determined	Child (n=1), observer	Experimental design	Partially successful. Positive outcomes in reaching out and locating an object	Visual impairment and additional disabilities	75
15	(Behl et al., 1993) USA	Children (n=35) and their caregivers	Randomised control trial	The results highlight the requirement of more comprehensive intervention for infants and toddlers	Visual impairment	50
16	(Dennison, 2001) USA	1,334 professionals who made an impact on 3,455 infants' life	Mixed method	Effectiveness of the project (in-service training model) is reported	Visual impairment with or without additional disabilities	75

736 (Continued)

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739 **Table 1.** Continued

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17	(Dale et al., 2019) UK	Children (n=54) and their parents, practitioners	Longitudinal observational study	No difference in developmental setback	Cortical visual impairments	75
18	(Khooshab et al., 2016) Iran	Mothers (n=52) with their children	Randomised control trial	Lower parenting stress Intervention group showed reduced parenting stress	Blindness	75

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744 **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”)

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Table 3. The components of the reviewed interventions

Components	Reviewed studies
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Orientation and mobility	Harley et al., 1986; Joffe, 1988
Collaboration between families and professionals	Beelmann & Brambring, 1998; Behl et al., 1993; Chen & Haney, 1999; Dale et al., 2019; Dennison, 2001; Dikowski, 1995; Erickson et al., 2007; Harley et al., 1986; Janssen et al., 2011; Joffe, 1988; Klein et al., 1988; Sarica et al., 2015
Professional guidance	Behl et al., 1993; Bregani et al., 1981; Bruce, 2002; Erickson et al., 2007; Harley et al., 1986; Klein et al., 1988
Home-based practices	Beelmann & Brambring, 1998; Behl et al., 1993; Bregani et al., 1981; Chen & Haney, 1999; Dale et al., 2019; Dennison, 2001; Harley et al., 1986; Joffe, 1988; Khooshab et al., 2016; Klein et al., 1988; Sarica et al., 2015; Skellenger & Hill, 1994
In-service training	Bruce, 2002; Chen & Haney, 1999; Dennison, 2001; Dikowski, 1995; Harley et al., 1986; Joffe, 1988; Rowland & Schweigert, 2000; Skellenger & Hill, 1994
Routine-based activities	Bruce, 2002; Dikowski, 1995; Rowland & Schweigert, 2000
Family training	Chen & Haney, 1999; Dale et al., 2019; Harley et al., 1986; Joffe, 1988; Sarica et al., 2015
Communication practices	Bregani et al., 1981; Chen & Haney, 1999; Janssen et al., 2011; Klein et al., 1988; Rowland & Schweigert, 2000; Sarica et al., 2015
