

Implementation evaluation of early intensive behavioral intervention programs for children with autism spectrum disorders: A systematic review of studies in the last decade



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ABSTRACT

For young children with autism spectrum disorders, one of the choice interventions is **Early Intensive Behavioral Intervention**. Over the past ten years, its effectiveness has been abundantly evaluated based on various parameters, including the intensity and duration of the intervention. Despite major advances in effectiveness evaluation, data concerning the implementation of the intervention are often described briefly, and the active ingredients of the intervention are but rarely linked to the documented effects. *Objectives:* This study aims at reviewing with a systematic method, the studies pertaining to EIBI provided to children with autism spectrum disorders over the past ten years (2005–2015) and at documenting the program implementation components described in the studies, based on Dane and Schneider's (1998) model in accordance with PRISMA guidelines.

Results: The results show that, although the variables related to intervention dosage and protocol are relatively well described, the authors do not always consider them in the effects analysis. Furthermore, the majority of the studies did not report information on intervention participation, differentiation or quality.

Conclusions: Data concerning the implementation of the intervention are partially described in the articles retained. In this regard, a better description of the intervention provided and a more systematic evaluation of its implementation seem necessary to detect the subtle differences in the effects of the intervention.

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1. Introduction

The prevalence of children with autism spectrum disorders (ASD) is now estimated at **one in 68 children (Center for Disease Control & Prevention, 2014)**, or even **one in 45 according to one recent survey (Center for Disease Control & Prevention, 2015)**. In Canada, the data indicate a slightly lower prevalence rate, of one in 127 children (Lazoff, Zhong, Piperni, & Fombonne, 2010). Parallel to the increasing prevalence is a rapidly growing demand for autism services (Keenan et al., 2015). To date, *Early Intensive Behavioral Intervention (EIBI)*, which **is based on the principles of applied behavioral analysis (ABA)**, is recognized as a choice intervention for

young children, as demonstrated in various systematic reviews and meta-analyses (Eikeseth, 2009; Eldevik et al., 2009; Huffman, Sutcliffe, Tanner, & Feldman, 2011; Makrygianni & Reed, 2010; National Autism Center, 2009, 2015; Reichow & Wolery, 2009; Reichow, 2012; Virués-Ortega, 2010). This type of intervention helps, notably, to improve the children's levels of adaptive functioning as well as their language, while reducing the severity of their autism-related symptoms, such as stereotypical gestures and behavioral disorders (Odom, Boyd et al., 2010; Odom, Collet-Klingenberg et al., 2010; Reichow, 2012; Reichow, Barton, Boyd, & Hume, 2014; Virués-Ortega, 2010; Warren et al., 2011; Young, Corea, Kimani, & Mandell, 2010; Wong et al., 2014). EIBI programs use a variety of ABA-based intervention procedures or strategies. The National Professional Development Center on Autism Spectrum Disorders (NPDC) has identified 27 focused ABA-based interventions, including Antecedent-Based Intervention, Discrete Trial Teaching, Reinforcement, Prompting, Task Analysis or Visual

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Supports (Wong et al., 2014). To distinguish these specific strategies from the more comprehensive programs, some authors propose two broad categories of autism intervention: Comprehensive Treatment Models (CTM) and Focused Interventions (Eikeseth & Klintwall, 2013; Odom, Boyd et al., 2010). This study focuses particularly on CTM.

1.1. Intervention success factors

Some conditions are now known to contribute to the effectiveness of EIBI programs for children; they include early intervention, a child–caseworker ratio of 1:1, an intensity of 25 to 40 h per week, a minimum duration of 12 months, the caseworker's training in the principles of ABA, supervision of the intervention, parental training and parental participation (Fava & Strauss, 2014; Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Makrygianni & Reed, 2010). Despite major advances in evidence-based practices, a gap remains between the scientific knowledge and the services provided in several educational areas, notably those designed for children with ASD (Cook & Odom, 2013; Odom et al., 2005; Odom, 2009; Odom, Collet-Klingenberg et al., 2010). Therefore, application of the knowledge is not always guaranteed, and intervention centers do not always have the capacity to translate best practices faithfully into intervention services (Cook & Odom, 2013).

1.2. Implementation outcomes

Implementation data are essential information that reflect how the programs were applied (Proctor et al., 2011). These data serve as indicators that can be used to document prior conditions that are required to achieve the objectives of community-based services. The attention given to the implementation measures helps improve our knowledge of the factors that influence the effectiveness of an intervention, in addition to providing the information needed to export evidence-based interventions to various sites outside a laboratory context (Proctor et al., 2011).

1.3. Implementation fidelity

Fidelity is an implementation component (Dunsenbury, Brannigan, Falco, & Hansen, 2003; Proctor et al., 2011). It is defined as the degree of compliance with which an intervention was implemented with respect to the program authors' original plans (Dunsenbury et al., 2003; Rabin, Brownson, Haire-Joshu, Kreuter, & Weaver, 2008). Among the data that could be collected when evaluating the implementation of an intervention program, fidelity is one component that is regularly assessed. Although there is no consensus on the best method to accomplish this, fidelity is generally measured by comparing the evidence-based intervention with the intervention actually implemented in the center (Proctor et al., 2011). This variable is also considered to be the critical link between research and practice. In the absence of implementation data, even the most effective intervention will not yield the desired outcomes (Cook & Odom, 2013).

1.4. Implementation fidelity dimensions

In other areas of psychosocial intervention, the scientific literature emphasizes very clearly that data concerning the implementation of a program cannot be ignored, because they help in understanding and interpreting the effectiveness of an intervention, in addition to providing the information required to replicate the intervention in practice (Bérubé, Coutu, Dubeau, Lafantaisie, & Devault, 2012; Bérubé et al., 2014; Dunsenbury et al., 2003; Durlak & DuPre, 2008; Durlak, 2010; Gresham, 2009; Joly,

Touchette, & Pauzé, 2009; Matson & Jang, 2013; Proctor et al., 2011).

Among the most commonly used models in the scientific literature, the one by Dane and Schneider (1998) was retained by several authors to document the implementation of a program (Dunsenbury et al., 2003; Durlak & DuPre, 2008; Meyers, Durlak, & Wandersman, 2012). This model is used to evaluate and describe the various components of an intervention program implemented in public services, in various fields of intervention (Bérubé et al., 2014; Dunsenbury et al., 2003; Dunsenbury, Brannigan, Hansen, Walsh, & Falco, 2005; Paquette, Joly, & Tourigny, 2010). It further serves to classify a multitude of implementation data under the following five components: 1) *adherence*, or adhesion, of the intervention with respect to the proposed program; 2) *quality* of the intervention, for example the quality of the relationship between the caseworker and the child; 3) *dosage*, or the participants' degree of exposure to the program; 4) *participation*, namely the participants' degree of engagement in the program; and 5) *differentiation*, that is, the difference between the program received and the interventions usually received by the clientele.

1.5. Implementation outcomes and the field of ASD

Several authors have found that the majority of published studies do not provide much information on program implementation in real-life intervention contexts (Cook & Odom, 2013). In fact, advances made in the field of implementation sciences continue to be ignored by the EIBI community (Cook & Odom, 2013; Matson & Jang, 2013; Sanetti & Kratochwill, 2009). To our knowledge, the model by Dane and Schneider (1998) has never been used to describe the implementation of EIBI programs with children with ASD. Yet, the use of this model in other research areas has demonstrated the influence of these dimensions on the intervention effects. For instance, several school-based prevention programs show that a higher quality intervention implementation is associated with greater effects (Askell-Williams, Dix, Lawson, & Slee, 2013; Dunsenbury et al., 2005; Little, 2015; Pettigrew et al., 2015). A significant *meta-analysis* on the subject led to the conclusion that the intervention effect size is from two to three times greater when researchers control the degree of implementation of the program (Durlak & DuPre, 2008). In the field of ASD, other authors have highlighted the importance of documenting intervention fidelity to better understand the effects (Hume et al., 2011; Wheeler et al., 2009). Furthermore, a few years ago, Wheeler et al. (2009) found that only 36% of the studies published between 1996 and 2006 included an implementation evaluation measure. Unfortunately, the degree of implementation has rarely been considered in studies on the effectiveness of EIBIs (Cook & Odom, 2013; Odom, Cox, & Brock, 2013; Wheeler et al., 2009). Moreover, several authors advise caution when interpreting the effectiveness of an intervention and insist that in the absence of information on the implementation, it is difficult to understand what caused the effects (Cook & Odom, 2013; Fiske, 2008; Gresham, Gansle, & Noel, 1993; Hume et al., 2011; McIntyre, Gresham, DiGennaro, & Reed, 2007; Peterson, Horner, & Wonderlich, 1982; Odom et al., 2013; Wheeler, Baggett, Fox, & Blevins, 2006; Wheeler et al., 2009). Yet, applied in the field of EIBI, implementation evaluations would help researchers and practice communities pinpoint the factors that are important to consider to optimize the effects of interventions designed for young children with ASD. Given the current state of knowledge on EIBI and the limited focus on the implementation of these programs, the purpose of the present study is to 1) review the studies having evaluated the EIBIs provided to children with ASD over the past ten years, 2) examine which implementation components were documented, and 3) check whether this information was linked to the data on the effects. We therefore

examined experimental and quasi-experimental studies that measured the effects of EIBI on preschool children.

2. Method

A literature search was conducted in the following databases: MedLine, PubMed and Science Direct Elsevier with a PRISMA Guidelines (Liberati, Altman, Tetzlaff, Mulrow, & Gøtzsche, 2009). The keywords used in the search were *early intensive behavioral intervention* associated with *autism*; *pervasive development disorder* and *autism spectrum disorder*; *child* and *preschool*. Also included were reference lists drawn from meta-analyses and systematic reviews published in the target period for this review; that is; between 2005 and 2015; to further enrich the search (Eldevik et al., 2009; Eikeseth, 2009; Huffman et al., 2011; Institut national d'excellence en santé et en services sociaux, 2014; Makrygianni & Reed, 2010; National Autism Center, 2009; Odom, Boyd et al., 2010; Odom, Collet-Klingenberg et al., 2010; Reichow & Wolery, 2009; Reichow et al., 2014; Reichow, 2012; Virués-Ortega, 2010; Warren et al., 2011; Young et al., 2010; Wong et al., 2014). The literature search was performed by the first author using the NPDC classification (Wong et al., 2014). The articles retained thus pertain more specifically to CTM. Articles concerning the effects of "focused interventions" were removed from the selection. A second person then evaluated the articles selected by the first author. This second evaluator holds a PhD; is a professor in the field of autism; and has experience; training; as well as publications in scientific journals; in the field of EIBI intervention evaluation.

2.1. Inclusion and exclusion criteria

Seven criteria were used to select which studies to retain for the review. To be eligible, the articles had to 1) concern the evaluation of ABA-based EIBI; 2) target children with ASD aged 7 years or under; 3) pertain to various spheres of development (e.g., communication, social skills, increase/decrease in behaviors); 4) be intensive (15 h per week or more); 5) be offered over a minimum period of six months; 6) be center-, classroom-, home- or preschool-based; 7) be published in English or in French, between 2005 and 2015.

3. Results

To begin, this literature search turned up 1354 articles. A first reading led to the elimination of 1257 articles. Next, the third author conducted a second evaluation of the articles retained by the first author. Another 55 articles were then excluded because they did not meet all the selection criteria. Finally, another 16 articles were removed following the reading of either the Method sections or the entire articles. Table 1 presents process used to select the articles. Once the selection protocol was complete, there remained 28 studies that met the selection criteria listed above (these articles are identified with an asterisk in the reference list). These 28 articles were coded based on an evaluation grid that was developed for this purpose based on the five components of Dane and Schneider' (1998) fidelity evaluation model. One third of the articles was independently recoded by the second author of the article. This second evaluator holds a PhD, is a professor in the field of program evaluation, and has publications in scientific journals in the field of psychosocial intervention evaluation relating to the model retained. Disagreements were discussed and another almost 20% (6/26) of the articles were independently coded to obtain an interjudge agreement of 100%.

The articles retained are presented in alphabetical order in Table 2. Each of the articles was coded so as to document the presence or absence of an evaluation by the authors of the five implementation dimensions (in accordance with Dane and Schneider's model) as well as their relationship with the effects. For this purpose, the following criteria were used: 1) the dosage received by the participants was evaluated; 1.1) the information on the dosage was linked to the intervention effects; 2) adherence to the program was assessed; 2.1) the authors considered adherence in the intervention effects analysis; 3) the authors evaluated the difference between their intervention and a comparison one; 3.1) the researchers linked the degree of differentiation to the intervention effects; 4) the quality of the intervention was evaluated; 4.1) the intervention effects were linked to the quality evaluation; 5) the authors measured the children's participation; and 5.1) the participation data were linked to the intervention effects.

Table 1
Article Selection Process.

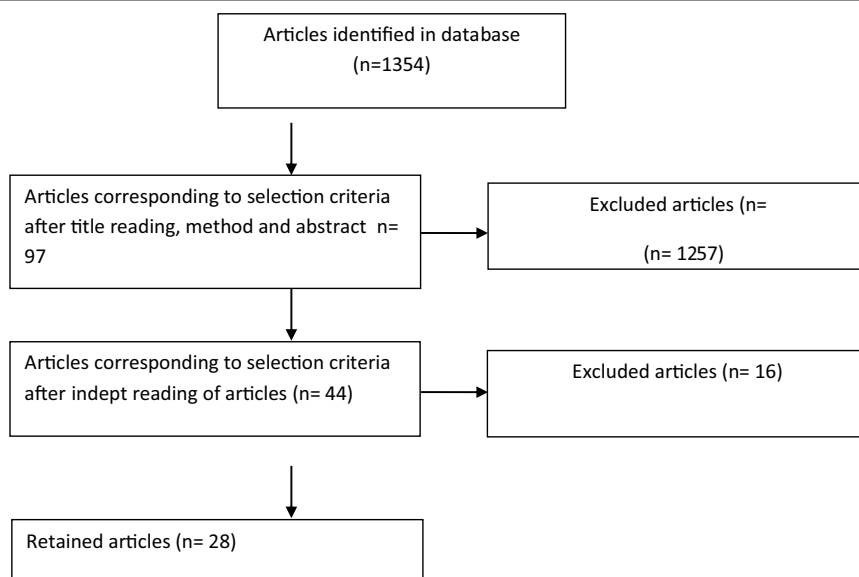


Table 2
Articles Codification.

Authors	Country	1-Dosage evaluation	1.1-Link between dosage and effect	2.1- Adherence evaluation	2.2-Link between adherence and effect	3- Différenciation	3.1-Link between differentiation and effects	4- Quality	4.1- Link between quality and effects	5- Participation	5.1- Link between participation and effects
1) Ben-Itzhak and Zachor (2007)	Israel	N	N	N	N	N	N	N	N	N	N
2) Beglinger and Smith (2005)	USA	Y	N	N	N	N	N	N	N	N	N
3) Cohen et al. (2006)	USA	Y	N	N	N	N	N	N	N	N	N
4) Dawson et al. (2010)	USA	N	N	N	N	N	N	N	N	N	N
5) Eapen et al. (2013)	Australia	Y	N	N	N	N	N	N	N	N	N
6) Eikeseth et al. (2012)	Norway	Y	N	N	N	N	N	N	N	N	N
7) Estes et al. (2015)	USA	Y	Y	Y	N	N	N	N	N	N	N
8) Fava et al. (2011)	Italy	Y	Y	Y	Y	N	N	N	N	N	N
9) Fernell et al. (2011)	Sweden	Y	Y	N	N	N	N	N	N	N	N
10) Flanagan et al. (2012)	Canada	Y	Y	N	N	N	N	N	N	N	N
11) Granpeesheh et al. (2009)	USA	N	N	N	N	N	N	N	N	N	N
12) Howard et al. (2005)	USA	Y	N	N	N	N	N	N	N	N	N
13) Howard et al. (2014)	USA	Y	N	N	N	N	N	N	N	N	N
14) Magiati et al. (2007)	USA	Y	Y	N	N	N	N	N	N	N	N
15) MacDonald et al. (2014)	USA	Y	N	N	N	N	N	N	N	N	N
16) Perry et al. (2008)	Canada	N	N	N	N	N	N	N	N	N	N
17) Perry et al. (2011)	Canada	N	N	N	N	N	N	N	N	N	N
18) Remington et al. (2007)	USA	Y	Y	N	N	N	N	N	N	N	N
19) Rivard et al. (2014)	Canada	Y	N	N	N	N	N	N	N	N	N
20) Sallows and Graupner (2005)	USA	Y	N	Y	N	N	N	N	N	N	N
21) Smith et al. (2010)	USA	N	N	Y	N	N	N	N	N	N	N
22) Smith I. et al. (2015)	Canada	N	N	Y	N	N	N	N	N	N	N
23) Smith T. et al. (2015)	USA	Y	Y	Y	N	N	N	Y	N	N	N
24) Stock et al. (2013)	Canada	Y	N	Y	N	N	N	N	N	N	N
25) Strauss et al. (2012)	Italy	Y	N	Y	Y	N	N	N	N	N	N
26) Virues-Ortega and Rodríguez (2013)	Spain	Y	Y	N	N	N	N	N	N	N	N
27) Vivanti et al. (2013)	Australia	Y	Y	Y	N	N	N	N	N	N	N
28) Vivanti et al. (2014)	Australia	Y	Y	N	N	N	N	Y	N	N	N
Compilation		19/28	10/28	8/28	2/28	0/28	0/28	1/28	0/28	0/28	0/28
		73%	36%	31%	8%	0%	0%	4%	0%	0%	0%

3.1. Dosage

This dimension refers to the participants' degree of exposure to the intervention offered. Even though all the authors indicate the proposed dosage, they do not systematically give information on the dosage actually administered to the children participating in the program. Among the 28 studies selected, 21 (75%) evaluated the dosage received by each participant (Beglinger & Smith, 2005; Cohen, Amerine-Dickens, & Smith, 2006; Eapen, Crnec, & Walter, 2013; Estes et al., 2015; Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Fava et al., 2011; Fernell et al., 2011; Flanagan, Perry, & Freeman, 2012; Howard, Stanislaw, Green, Sparkman, & Cohen, 2014; Magiati, Charman, & Howlin, 2007; MacDonald, Parry-Cruwys, Duper, & Ahearn, 2014; Remington et al., 2007; Rivard, Therroux, & Mercier, 2014; Sallows & Graupner, 2005; Smith, Klorman, & Mruzek, 2015; Stock, Miranda, & Smith, 2013; Strauss et al., 2012; Virues-Ortega & Rodríguez, 2013; Vivanti, Dissanayake, Zierhut, & Rogers, 2013; Vivanti et al., 2014). The dosage provided varies between 15 and 35 h per week, and the duration, from six to 36 months. Additionally, ten articles (36%) considered the dosage variable in the intervention effects analysis (Estes et al., 2015; Fava et al., 2011; Fernell et al., 2011; Flanagan et al., 2012; Magiati et al., 2007; Remington et al., 2007; Smith T. et al., 2015; Virues-Ortega & Rodríguez, 2013; Vivanti et al., 2013, 2014).

Two main trends emerged from the studies that did consider dosage in the effects analysis. Some authors conclude that a higher value for this variable (hours per week and program duration) produces greater benefits for the children (Flanagan et al., 2012; Magiati et al., 2007; Remington et al., 2007; Rivard et al., 2014; Virues-Ortega & Rodríguez, 2013). Others conclude rather that the dosage does not necessarily influence the effects, but that other variables, such as the child's, parents' and caseworkers' characteristics, do (Fernell et al., 2011; Strauss et al., 2012; Vivanti et al., 2013).

3.2. Adherence

This dimension concerns the extent to which the intervention complied with the proposed program. In all the studies, the authors provide information regarding the intervention offered. The most frequently mentioned interventions include discrete trial teaching, natural environment teaching, and incidental teaching. UCLA, Verbal Behavior and Pivotal Response Training, in addition to various intervention curriculums, are the most commonly cited intervention models (Maurice et al., 1996; Koegel & Koegel, 1995). However, only nine of the 28 studies (32%) conducted a compliance (or adherence) assessment. The two main tools used were: a checklist filled out after the viewing of videotapes of the intervention sessions (Estes et al., 2015; Fava et al., 2011; Sallows & Graupner, 2005; Stock et al., 2013; Strauss et al., 2012; Vivanti et al., 2013; Vivanti et al., 2014) and an observational measure of the intervention sessions (Smith T. et al., 2015; Smith et al., 2010; Smith I. et al., 2015). Finally, despite the mention of an intervention adherence assessment in these eight studies, only two (8%) analyzed the relationship between this variable and the intervention effects (Fava et al., 2011; Strauss et al., 2012). The authors concluded that a high level of fidelity on the part of the caseworkers helps improve the children's behaviors and decrease parental stress.

3.3. Differentiation

This dimension serves to distinguish between two intervention types and to identify which program component is related to the effects. Among the articles evaluated, 16 (62%) compared the effectiveness of two intervention types, e.g., eclectic programs

versus an ABA-based one or two programs with different dosages (Eikeseth et al., 2012; Fava et al., 2011; Fernell et al., 2011; Flanagan et al., 2012; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Howard et al., 2014; MacDonald et al., 2014; Magiati et al., 2007; Smith et al., 2010; Smith, Flanagan, Garon, & Bryson, 2015; Remington et al., 2007; Rivard et al., 2014; Sallows & Graupner, 2005; Stock et al., 2013; Strauss et al., 2012; Virues-Ortega & Rodríguez, 2013). Nevertheless, none of the studies performed an actual differentiation assessment to see how much the programs offered differed from one another and to which program component the results could be attributed. Without this analysis of the various program components, it is especially difficult to pinpoint which EIBI particularities account for the advantages of this program over the so-called eclectic ones. In fact, other than the dosage, the content of each type of intervention is poorly described and is not analyzed in terms of differentiation.

3.4. Quality

Although this dimension may be evaluated from various angles depending on the authors, it generally concerns the quality of the services provided, notably how well the caseworker masters the program; the characteristics related to the caseworker's know-how; and the relationship between the caseworker and the program recipient, whom, in this case, is a child with an autism spectrum disorder. Among the 28 studies examined, only two articles (7%) evaluated this dimension (Smith T. et al., 2015; Vivanti et al., 2013). Despite the mention of quality evaluation in this article, the authors did not evaluate the relationship between this variable and the intervention effects. For the others 27 articles, consequently, the information on quality could not be used in the intervention effects analysis to determine whether this variable could influence the effectiveness of the intervention.

3.5. Participation

This dimension concerns the participants' degree of engagement in an intervention program, for example, their level of attention during tasks. None of the 26 studies selected documented this component. As in the case of quality, in the absence of information on participation, the effects analysis could not show whether this dimension could have an impact on the effects of EIBI.

In total, among the articles evaluated, only 11 (39%) considered one or several implementation components in the intervention effects analysis. More specifically, 10 articles (36%) analyzed the dosage data, one article (4%) considered information on adherence, and another one (4%) incorporated both dosage and adherence in the effects analysis.

4. Discussion

These results illustrate clearly that the data on intervention implementation are often partially described in studies on the effectiveness of EIBI. In this branch of intervention, as in several others, quantity (or intervention dosage) is a widely studied variable in the scientific literature, but implementation quality evaluations remain the exception rather than the rule (Cook & Odom, 2013; Downer & Yazejian, 2013; Fiske, 2008; McMahon & Cullinan, 2014; Wheeler et al., 2009). In the articles retained, the most commonly evaluated dimensions are intervention dosage and adherence. Nonetheless, the description of the intervention offered is often general and imprecise. The authors usually mention the proposed dosage and the reference curriculum but do not systematically assess adherence to these parameters in practice. In the articles evaluated, several authors do not use the information regarding implementation to analyze and interpret

the intervention effects and identify the variables that influence the progress of children receiving the program.

Furthermore, none of the studies specifically analyzed the difference between two intervention types to help identify specifically which program components were responsible for the effects or the extent of the difference between ABA-based programs and eclectic ones. Instead, the authors generally used variables related to the children (e.g., age, adaptive functioning level, intellectual quotient or symptom severity prior to the intervention) to analyze the intervention effects, but did not examine how these variables relate to the characteristics of the intervention received. Furthermore, most of the authors did not include a fidelity measure in their studies to help understand the implementation process and the relationships between the implementation and the results of the intervention, as suggested by Proctor et al. (2011), among others.

The scientific literature recommends implementing EIBI programs for 25 to 40 h per week over a period of 12 to 24 months (Fava & Strauss, 2014; Granpeesheh et al., 2009; Makrygianni & Reed, 2010). The intensity of the intervention offered in the 26 studies evaluated varies between 15 and 35 h per week, over a period varying from six to 36 months. Whereas some authors conclude that the dosage (or intensity) of the intervention is a variable that mediates the effects (Flanagan et al., 2012; Magiati et al., 2007; Remington et al., 2007; Rivard et al., 2014; Virues-Ortega & Rodríguez, 2013), others qualify these conclusions by pointing out that the effects are influenced mostly by the variables related to the children, such as their development level before the intervention, as well as by those related to the parents and caseworkers (Fennell et al., 2011; Strauss et al., 2012; Vivanti et al., 2013).

Concerning adherence, little attention was given in the studies examined to systematically evaluating the intervention protocol implemented compared with the one initially proposed. The studies published in the past ten years that were retained based on the above-described selection criteria generally give little information concerning the intervention provided, as already pointed out by other authors (Cook & Odom, 2013; Fiske, 2008; Gresham et al., 1993; Matson & Jang, 2013; McIntyre et al., 2007; Wheeler et al., 2009). The few authors who did assess adherence to the intervention protocol did so notably using checklists and by systematically observing videos of the intervention sessions. However, only one of the studies linked this information to the effects of the programs evaluated, and it shows that intervention-related variables, notably application adherence, influence the effects on the children (Strauss et al., 2012).

Regarding the differentiation dimension, despite several studies including a comparison group, none attempted to distinguish which specific components of each program were responsible for its effectiveness or to determine how much the interventions actually differed from one another. Finally, information on the quality and participation dimensions is practically non-existent in the articles retained and, consequently, was not used to interpret the intervention effects. These results clearly demonstrate the limitations relating to implementation evaluation in studies on the effectiveness of EIBI administered to children with ASD (Cook & Odom, 2013; Fiske, 2008; Gresham et al., 1993; McIntyre et al., 2007; Odom et al., 2013; Wheeler et al., 2009).

In other fields, authors use the information on the program implementation to better understand the factors responsible for the progress and to interpret the effects in light of this information (Durlak & DuPre, 2008; Paquette et al., 2010). The implementation of an intervention protocol is not guaranteed, and the programs may be modified or adapted in practice. Without implementation data, it is risky to conclude that an intervention is effective, since the one implemented could differ from the one originally

proposed. The risk is even greater in the case of an intervention like EIBI, which consists of several procedures that are applied differently depending on each child's development level and needs.

Among the various tools used to evaluate implementation fidelity, self-reported measures as well as checklists based on direct observation and audiotapes seem to be the most commonly used (Fava et al., 2011; Sallows & Graupner, 2005; Smith et al., 2010; Stock et al., 2013; Strauss et al., 2012). Regarding the field of autism, a few tools have emerged without, however, being generalized in the publications on EIBI effectiveness evaluation (Whitehead, Blacklock, & Perry, 2012). Despite the relevance of these means, these various fidelity evaluation tools are "home-made" and specific to each program evaluated. In fact, to date, there does not seem to be a consensus on what constitutes EIBI. Definitions differ from one program or study to the next. Consequently, authors who propose measures of implementation fidelity or quality focus on elements that differ from the CTM. This makes it difficult to access standardized evaluation tools that match their model.

In the era of Evidence-Based Practices, it is crucial that implementation measures be incorporated in future research and that they be analyzed in the effects evaluation. Thus far, despite being partially used in a few studies, these data are generally treated as components of prior training for caseworkers, and not as influencing factors in intervention effectiveness. Concerning their contribution for clinical settings, implementation measures could serve as a guide for applying and evaluating practices, in addition to ensuring standardization between centers.

Despite the important contribution of the NPDC's work regarding implementation and evaluation of focused intervention, few tools or methods seem to be currently available for intervention centers that would like to implement good practices in comprehensive programs (CTM) as defined by the NPDC (Wong et al., 2014). Therefore, future work in the field of EIBI should focus on developing standardized evaluation tools that could be used to regularly assess implementation fidelity of the comprehensive models (CTM) and provide guidelines to intervention centers that would like to use them. This type of tool would undoubtedly represent the way to faithfully implement evidence-based quality practices in the community's intervention centers.

5. Lessons learned

Several interventions are now identified as being effective for intervening with young children (Wong et al., 2014). The term "EIBI," commonly used in the field of ASD, refers notably to the use of ABA principles and procedures. It would thus be important to take a close look at the fidelity and quality of the implementation of these procedures with children with ASD. In the future, studies on the effectiveness of EIBI should provide more information on all the dimensions of the programs evaluated, as suggested in Dane and Schneider's (1998) model. The present review shows that dosage and adherence are currently well described, but that few studies provide sufficient information to replicate the intervention in practice and systematically assess adherence to the proposed intervention protocol.

Finally, the evidence-based practices movement is now very present in the field of ASD intervention. EIBI is recognized for its effectiveness with children, but it may also comprise a variety of intervention procedures that are somewhat ill-defined for the purpose of putting them into practice (Cook & Odom, 2013; Dillenburger et al., 2014). A better definition of EIBI programs, as well as improved evaluations of their implementation in practice, seems necessary to ensure that children with ASD and their families derive benefits from the interventions. In the future, it is

imperative that the issue of implementation evaluation be considered by the various actors involved in the design, implementation and evaluation of the programs. Program designers should provide various means of evaluating the implementation for each program or published curriculum so that clinicians can ensure proper implementation and ongoing evaluation of the main intervention ingredients. Researchers should evaluate the various implementation components using tools that can help link the components to the intervention effects. Those tools are mostly home-made instruments that are customized to reflect the particularities of the intervention and often take the form of checklists, observation grids and self-report questionnaires (Proctor et al., 2011). The results of these evaluations could thus guide decision makers by shedding light on which components are best suited for ensuring effective interventions and quality services for children with ASD and their families.

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