Organizations' choices when implementing an Early Intensive Behavioral Intervention program (EIBI)

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Abstract
The organizations' characteristics and choices are essential components of an action plan that favors quality program implementation, a prelude to effectiveness, especially in natural environment. The objectives of this study are to describe the choices made by rehabilitation centers (CRDITED) in the context of a universal community based on Early Intensive Behavioral Intervention program (EIBI) for 2 to 5 year-old children with autism spectrum disorder (ASD) in Québec (Canada). Based on a theoretical evaluation model, a questionnaire was filled out by 15 CRDITEDs, covering the large majority of the Quebec territory but also the Quebec population. Results show a great diversity between the different CRDITEDs. Factors that impact implementation quality are identified. Absence of evidence-based implementation practices and the diversity of the approaches to EIBI are discussed.

Keywords: Early Intensive Behavioral Intervention; Program implementation; Organizations' choices; Complex intervention programs; Autism spectrum disorders; Community based program.

1. Introduction

This research concerns the choices made by organizations regarding various program components involved in the implementation of Early Intensive Behavioral Intervention (EIBI) for young children with autism spectrum disorders (ASD). The organizations' characteristics and choices, like those of the caseworkers, are essential components of an action plan that favors quality program implementation, a prelude to effectiveness, especially in natural settings (Chen, 2015; Metz *et al*., 2013). To fully understand this issue, let us

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situate our research in a broader context of the scope of knowledge on EIBI for young children with ASD.

2. General background

First, it is evident that much research effort has been made over the past several years to demonstrate the efficacy and the effectiveness of EIBI for young children with ASD (Boyd *et al*., 2014; Cohen, Amerine-Dickens and Smith, 2006; Eikeseth, 2009). These studies helped the scientific community recognize that EIBI should be favored as an intervention for young children with ASD.

Furthermore, several countries, states or provinces favor this type of intervention for young children with ASD (Salomon *et al*., 2015). This is the case for Quebec (Canada). In 2003, an action plan called "A Future-Oriented Gesture"[6], published by the ministère de la Santé et des Services sociaux (MSSS), recommended the application of Early Intensive Behavioral Intervention (EIBI), based on applied behavioral analysis (ABA), for about twenty hours per week for 2- to 5 year-old children with pervasive developmental disorders (PDD)[7] (MSSS, 2003). The decision by the MSSS to implement EIBI was made in light of the information available in the scientific literature at that time as well as of the advice of experts. EIBI then developed in the various centres de réadaptation en déficience intellectuelle et en troubles envahissants du développement[8] (CRDITED) and became part of the specialized services that they provide.

Despite the fact that a part of the scientific community recognizes that EIBI should be favored as an intervention for young children with ASD, this assumption is nonetheless accompanied by some criticisms regarding the studies conducted. They include: limited evidence (Warren *et al*., 2011); a need to improve certain methodological aspects, such as the attribution or definition of the experimental and control groups (Matson and Jang, 2013); a poorly detailed description of the independent variables specifying the curriculum and important intervention elements (Lechago and Carr, 2008); the choice of indicators or measures of the dependent variables (Matson, 2007), including proximal measures relevant to the learning mechanisms (Vivanti *et al*., 2014); or even the need to assess the long-term effects (Matson and Konst, 2013). Furthermore, some researchers claim that the main empirical principles

[6] Free translation: Un geste porteur d'avenir.

[7] It should be noted that the term "PDD" is now replaced by the term "autism spectrum disorder (ASD)" in accordance with the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (APA, 2013).

[8] Readaptation centers for intellectual disabilities and pervasive developmental disorders.

certifying the effectiveness of EIBI rest on short-term studies conducted with a small number of children, in a select population, under conditions where the program is applied on a small scale and in a university setting rather than a natural intervention context (Fava and Strauss, 2011). A comparison of recent systematic reviews considering the level of evidence (National Autism Center, 2009; Odom *et al*., 2010) helps grasp the complexity and variability of these scientific productions and of their results.

Noting that the effectiveness of EIBI is not universal (Vivanti *et al*., 2014), several studies focused on its influencing factors. A few characteristics of the children related to a better response to the intervention were thus identified. These characteristics are mainly the age at the beginning of the intervention, the initial level of adaptive skills, and the IQ at the start of the intervention (Flanagan *et al*., 2012). Recently, social engagement was added to these characteristics by Smith and colleagues (Smith, Klorman and Mruzek, 2015). It was also found that intervention characteristics, such as duration or intensity, are related to the effects of the intervention (Viruès-Ortega, Rodriguez and Yu, 2013). Without claiming to systematically examine the implementation of the programs, these more recent studies already point to certain program components likely to affect the quality of the implementation and the effectiveness of the intervention.

Still without claiming to systematically examine the implementation of EIBI, other studies examined factors that facilitate or hinder its implementation by the parents at home (Boettcher Minjarez *et al*., 2011), by teachers in school (Hume *et al*., 2011) or by both (Fava and Strauss, 2011). They thus brought to light the essential role of the professionals' training in a better or more compliant implementation of the programs for children with ASD (Weinkauf *et al*., 2011) but also of the supervision itself of this intervention (Eikeseth *et al*., 2009).

However, very few studies have focused more particularly on the caseworkers' practices per se. Gould *et al*. (2011) studied, more specifically, the practices used for assessing children, including the tools employed, to determine the content of the interventions to be provided to the children. Mudford *et al*. (2001) focused rather on the characteristics of the programs offered in the United Kingdom by comparing them with the one proposed by Lovaas (1987). They also found that children received fewer hours of intervention, that parents received less supervision than recommended and that this supervision was not necessarily performed by certified persons. Symes *et al*. (2006) interviewed 19 therapists regarding the factors that facilitate their implementation of EIBI with youths with ASD. They thus identified training as the main facilitating factor in the implementation of EIBI, followed by the caseworker's patience and the children's characteristics. Children's difficult behaviors or their lack of progress despite a long period of intervention are the factors that most hinder implementation by caseworkers.

However, it is Love *et al*. (2009) who drew a more complete portrait of caseworkers' EIBI practices based on a survey conducted with 211 program supervisors. Among the key conclusions, the authors underscore the great variability of the implemented programs. More specifically, they stress the fact that supervisors report using more than one curriculum manual, thus suggesting that none of the available curriculums meets all the needs. Additionally, the authors reveal that supervision occurs less frequently than desired in some programs, supervisors generally hold a master's or doctoral degree but only around 50% are certified in behavioral analysis, and that a good proportion of the programs seems to apply the specific best practices whereas a certain proportion (nearly a third) does not do so or applies practices that are not recommended. Their results indicate also that nearly half of the children receive less than 20 hours per week and the other half more than 20 hours. This great variability in the programs was also observed on a smaller scale in a Quebec study that included a self-evaluation of the fidelity of caseworkers' implementation of EIBI (Gamache, Joly and Dionne, 2011).

Despite the great interest of these few studies in caseworkers' practices, none of them paid particular attention to the organizations. Yet, these organizations constitute an important link between the program designers, the researchers who disseminate the results on the effectiveness of the intervention programs, the policy makers who decide to fund the implementation of the programs, and the caseworkers who interact directly with the children. The organizations' role in implementing programs for children and adolescents has been recognized for several years already as being an essential component in attaining efficacy (Fixsen *et al*., 2013). Even if these organizations may vary considerably from one country to another or even among provinces or states, depending on the country, they play an essential, but unknown, role in disseminating the programs on a large scale. In fact, there are still very few studies having paid particular attention to the organizations. It therefore seems important to us to describe the choices that organizations make in terms of program implementation, to understand the implementation contexts in which caseworkers apply such complex programs as EIBI.

Very recently, several researchers drew attention to the importance of developing a true implementation science in the education field (Odom *et al*., 2010), particularly for the services targeting children with ASD (Odom *et al*., 2013). Studying the choices that organizations make regarding a program like EIBI is therefore necessary for developing this implementation science.

The objective of this study is to describe the choices made by the CRDITEDs in Quebec, which are the organizations responsible for implementing a universal EIBI program for 2- to 5-year-old children with ASD. The aim of this study is to understand how the organizations are handling

their obligation to set up complex intervention programs targeting children and families in need. More specifically, we wish to describe the programs implemented, assess these organizations' self-evaluations with respect to the quality of the programs implemented and determine the extent to which the organizations have adhered to the EIBI principles, so as to understand the issues related to the large-scale implementation of complex programs in a context with multiple constraints. This constitutes Phase 1 of a larger project aiming to describe the implementation of EIBI in Quebec and to evaluate its effects in a real world.

3. The EIBI program in the context of Quebec

Quebec is a Canadian province of nearly eight million inhabitants, covering a territory of 1,667,712 km^2 (Institut de la statistique du Québec, 2014). The mother tongue of slightly less than 80% of the people is French. In Quebec, the ministère de la Santé et des Services sociaux[9] (MSSS) decided in 2003 to implement a free, universal EIBI program based on applied behavioral analysis (ABA), for twenty hours per week, for all 2- to 5-year-old children with pervasive developmental disorders (PDD; Gouvernement du Québec, 2003). However, this measure was part of a comprehensive effort to organize the array of services for children with ASD. At that point, the 21 CRDITEDs were given the mandate to implement EIBI in each of their respective regions. These 21 CRDITEDs cover the 18 administrative regions of Quebec, including the territories with small populations located far from the large urban centers. An accredited training program was also developed in collaboration with a university to offer interested professionals a general training in the EIBI program. This does not mean that all CRDITED caseworkers working with children with ASD received this training.

Since 2003, the EIBI program has not been systematically evaluated. Nonetheless, three reviews, two of which are available, were conducted (Gouvernement du Québec, 2009, 2012). The three reviews examined data from questionnaires filled out by the persons responsible in the health and social services agencies that coordinate the programs in the CRDITEDs. The last one also included a large number of discussion groups with stakeholders and experts. These reviews concerned the entire range of services, not only the EIBI program. Finally, the 2012 review (pp. 44-45) indicated that 882 children had received the program in 2010-2011; that the program is considered to be

[9] Ministry of Health and Social Services.

well implemented; that, according to parents and several groups that were met, the program seems to produce tangible results for the majority of the children registered; and that the timeframe for receiving a diagnostic assessment of the children reduces its accessibility. The present project thus helps to validate certain conclusions from these reviews using a systematic approach relying on a recognized evaluation model.

4. Methodology

4.1. Evaluation model

As part of the first component of a broader study on the implementation and effects of EIBI programs, the selected model for evaluating the implementation is the one based on the program theory proposed by Chen (2015). According to Chen's (2015) model, the essential components of an action plan that targets the implementation of a program and that guides its evaluation are the following: the organization, the people who implement the program, the intervention and service delivery protocols, the target clientele, the partners, and the ecological context. More specifically, the holistic approach was retained for examining all the components of the action model as implemented by the CRDITEDs at the time of the study in 2011-2012.

4.2. Data collection methods

Two collection methods were used during this Phase 1 of the study. The first is a questionnaire sent to all the CRDITEDs. It consists of questions translated and adapted from the questionnaire by Love *et al*. (2009) as well as questions from the one proposed by Gamache, Joly and Dionne (2010). It includes nine sections, where each section (except the first) groups together questions on the practices in effect in the CRDITED as well as questions pertaining to the self-evaluation, based on a 10-point scale, of the quality or fidelity of the implementation of EIBI. The first section identifies the respondent(s) in the CRDITED. The second consists of general questions regarding the program implemented (intervention location, number of children reached, documentation used, overall self-evaluation of the implementation and the documentation). The third concerns the clientele, including the selection criteria, volume and presence of waiting lists. The fourth addresses the clinical process (intervention protocol), including identification of the child's needs, choice of intervention targets, choice of intervention means, and follow-up on the child. The fifth

section is devoted to the people who implement the program, including their characteristics but also their enthusiasm. The sixth is comprised of questions regarding the organization itself, including its human resources as well as its supervision and training practices. The seventh proposes questions relating to the partners and, finally, the eighth asks about elements of the ecological context, including the main difficulties encountered and the facilitating factors.

In addition to the questionnaire, each CRDITED was invited to send the research team all the EIBI documents used in their CRDITED. These documents were compared with the answers given in the questionnaire. The researchers used them to classify the CRDITEDs according to the EIBI model favored by each one.

4.3. Sample and Analysis

In this first phase of the study, the analysis unit is an organization, and more specifically a CRDITED. Fifteen CRDITED accepted to participate and returned the questionnaire to the research team, for a response rate of 68.2%. However, one CRDITED returned two questionnaires and another returned three questionnaires because their practices differ according to the territories covered. Therefore, 18 questionnaires were analyzed, covering the large majority of the Quebec territory but also the Quebec population.

A descriptive analysis was used to examine the results obtained through the questionnaire. The open-ended questions were coded by grouping the answers by theme. Implementation quality and fidelity in the organization are analyzed based on quantitative self-evaluation data.

5. Results

The results are presented in three sections. The first presents a description of practices reported using the Love *et al*. (2009) method, but according to the components of an action plan for implementing a program according to Chen (2015). The second describes the main factors that favor or hinder the implementation of the EIBI program in the CRDITEDs. Finally, the third section reports the self-evaluation scores for implementation quality or fidelity.

5.1. EIBI practices in the CRDITEDs

As specified earlier, these practices are described for each of the action plan components according to Chen (2015) and not only for the intervention protocol.

5.1.1. Support from the organization

The presence of the resources needed to implement the EIBI program is qualified by the majority of the centers (11/18) as "average." Despite this rather positive perception of the availability of resources, the centers stress a shortage of personnel (7/18) and lack of training (3/18). The frequency of the supervisions is monthly for five centers, weekly for four of them, and varies for the other centers from two or three times a week to only once every six weeks. The majority of the centers address the intervention techniques/strategies and the relationships with the partners and parents (12/18). A few centers report addressing problem situations (4/18) and observation data (3/18), while problem behaviors (2/18), generalization (2/18), inclusion in the group (2/18), particularities of the child with PDD (2/18), and continuing education or knowledge transfer (2/18) are less frequently addressed. The analysis of the ratings pertaining to the children's target behaviors is performed by the supervisors monthly for six centers while the frequency varies for the others, ranging from the absence of rating analyses to bi-weekly analyses. The number of children for whom each supervisor must conduct a follow-up is more than six for the majority of the centers (10/18).

5.1.2. People who implement the program

The majority of caseworkers who apply the program have a college diploma or equivalent (13/18). Four of the centers indicate that their caseworkers generally hold a bachelor's degree (4/18). The centers mention that a certain percentage of their caseworkers are trained in EIBI through specialized training programs, such as the Plan national de formation PDD[10], the DESS[11] in behavioral intervention or the Board certified assistant behavior analysts or Board Certified Behavior Analyst (BCABA/BCBA). The number of hours of training offered by the institution when a person is hired varies by center: less than 15 hours (3/18), between 16 and 30 hours (4/18) and between 31 and 45 hours (4/18), and more than 45 hours (2/18). Caseworkers are qualified as "very enthusiastic" about the program for the large majority of the centers (15/18).

5.1.3. Partners

All the respondents indicate that the daycare centers (mainly the centres de la petite enfance[12]) are privileged partners in the EIBI programs (18/18). The

[10] National plan for training in pervasive developmental disorders.
[11] Specialized graduate diploma.
[12] Early childhood centers.

other partner organizations are the school community (13/18), the centres de santé et de services sociaux[13] (CSSS; 12/18), the hospital community (9/18), the centres de réadaptation en déficience physique[14] (4/18) and private practice professionals (4/18).

5.1.4. Intervention protocol and services offered

Almost all the centers say that they provide between 11 and 20 hours of intervention per week (17/18). The locations where children receive EIBI are, in a large proportion, the child's home (16/18) and the daycare center (15/18). Some centers mentioned conducting EIBI in the center or a clinic (6/18), in a regular school (6/18) or in a specialized school (3/18). The most commonly used curriculum is the one by Maurice et al. (1996; 16/18), followed by the one by Lovaas (2003; 6/18), Lovaas (1981; 3/18), Sundberg and Partington (1998; 3/18) and the one by Prizant *et al*. (2006) (3/18). A diversity of intervention means is mentioned: discrete trial training, incidental teaching, visual aids, fading, shaping, modeling, Picture Exchange Communication System (PECS), social scenarios, personalized structured incentive and intervention. The majority of the centers regularly use more than one assessment instrument (14/18). Four centers mention using only one instrument: the Battelle (1/18) or the PEP-R/PEP-III (3/18). Among the instruments mentioned, the most popular is the PEP-R/PEP-III (15/18). When asked about the number of caseworkers who apply the daily program with the same child, the majority of the centers say from one to two caseworkers (15/18).

The parents' participation occurs during the assessment (14/18) and the identification of intervention targets (11/18). Their typical involvement with respect to the intervention is qualified for the great majority (14/18) as a bit of incidental teaching.

5.1.5. Target population

Nearly all the centers mention the presence of a waiting list (16/18). The number of children on this list varies greatly from one center to the next (3, 7, 9, 20, 24, 45, 50, 67, 75 and up to 120 children). The average age of the children served by the EIBI programs varies from 3 years (6/18) to 4 years (11/18). The minimum age of the clientele most frequently identified by the centers is 2 years (11/18). Other centers indicate: less than 2 years (2/18), 3

[13] Health and social services centers.
[14] Rehabilitation centers for physical disabilities.

years (4/18) and 4 years (1/18). The most common maximum ages are 5 years (8/18) and 6 years (9/18).

5.2. Factors that favor or hinder the implementation of EIBI

The data reported here are derived from the answers to two open-ended questions asking respondents to identify, in order of importance, the three factors that most favor the implementation of EIBI in their organization and those that hinder it the most. The answers were grouped according to the same components from Chen's model (2015) as in the previous section.

5.2.1. Support from the organization

More specifically, training of team members, including caseworkers, supervisors, professionals or administrators, is named as a factor facilitating the implementation by 11 of the 18 centers. However, the lack of support from the organization in general, the center's difficulty to maintain a certain level of expertise due to personnel turnover or a shortage of resources, and a lack of training due to budgetary and time constraints are underscored by two centers, while the lack of professional support in general, the lack of clinical supervision for the interdisciplinary team and more specifically the lack of time to observe the intervention sessions are some of the difficulties reported by one or a few centers, but not in general.

5.2.2. People who implement the program

Eight centers report the fact that caseworkers who are interested, invested, motivated and dynamic constitute a favorable factor in the implementation of the program. Staff turnover is considered an obstacle to the implementation by seven centers. In fact, some centers underscore difficulties recruiting and retaining trained personnel, and even a shortage of personnel for one of them. However, stability of personnel, as well as having acquired some experience in EIBI intervention, is perceived as a facilitating factor by five of the centers. A good understanding of what EIBI is, through theoretical and practical knowledge, is highlighted as a facilitating element in the implementation by two centers.

The lack of training of the caseworkers who apply the program is reported by four centers as an element hindering implementation. Staff is sometimes inexperienced, which creates challenges in terms of maintaining expertise. Three centers specify that difficulty accessing a call-back list of trained

people for substitutions is an obstacle to the implementation of EIBI. Difficulty recruiting supervisors is also mentioned by one of the responding centers. In fact, one respondent stresses the work overload of the professionals and experts in clinical activities. Another one mentions that the new generation of caseworkers (new graduates in special education technique) do not have good knowledge of the clientele. The shortage of human resources in general is reported by four centers.

5.2.3. Partners

Three of the centers highlight the fact that the participation of all actors involved with the child, including the parents, is conducive to the implementation of the program. The parents' involvement and mobilization are perceived as variable by three centers. One respondent mentions the rather limited cooperation of the partners and schools. The absence of a formal collaboration agreement with the daycare centers is reported as an obstacle by two centers. Moreover, one respondent mentions that work conditions in general in daycare centers can be an obstacle to implementation. A lack of time for sensitizing the partners, notably daycare centers and schools, is identified by one of the centers as a hindrance to implementation. Another underscores the daycare centers' difficulty recognizing each party's expertise. A lack of primary support to assist and mobilize the parents is named by one respondent.

5.2.4. Intervention protocols and services offered

The fact that the clinical process used in EIBI is clearly defined and supervised is perceived by one center as a factor favoring the implementation of the program. Generally, the evidence-based approach (applied behavioral analysis) that was retained is perceived by one center as a facilitating factor. One center suggests that the adoption of a program is in itself a facilitating element in its implementation, and another one mentions the level of accuracy of this program, as well as of each child's program. Intervention follow-up is also identified as a facilitator implementation. The low caseworker/child ratio is also perceived as an asset in the implementation.

Support offered to families as part of the program is perceived as a facilitating factor, notably because it favors parental involvement. Another center proposes as a facilitating factor the fact that the intervention is offered in all of the child's living environments.

The absence of a clearly defined program is named by one center as an obstacle to the implementation of EIBI. The lack of documentation is highlighted by two respondents. Another one mentions that the complexity of

the approach and the time required for a caseworker to become completely autonomous hampers the implementation of the program. According to one respondent, the high number of hours required compared with the availability of the children, families and centers is an obstacle to setting up the program.

5.2.5. Target population

Regarding the target population, only the absence of waiting times for children to access services is underscored as a facilitating factor by two centers. Parents are also perceived as a facilitating factor by one of the centers. Astonishingly, despite the presence of waiting lists seen in the previous section, only one center mentions it as an obstacle to the implementation of the program.

5.2.6. Ecological context

In this section regarding the factors that favor or hinder implementation, we can address this component from Chen's model (2015) that was not addressed in the previous section. We now see that the size of the territories to be served is named by one center as a factor hindering the set-up of EIBI. In this regard, one of the respondents identifies professionals' geographical distance as an obstacle. One of the centers stresses that territory-based administration leads to a multiplication of department heads. Another one mentions that the caseload is regional and creates more travelling.

The lack of budget, notably for increasing human resources and reducing the waiting list, is identified as a factor hindering implementation by four of the centers. Furthermore, the cost of the service is named by one of the centers. Finally, the ministry's requirements in terms of the access plan pose a daunting challenge, considering the high intensity of intervention hours to be provided to the children, and sometimes lead to a reduced intervention.

5.3. Self-evaluation of implementation quality and fidelity

In addition to the previously addressed qualitative aspects, the centers had to evaluate themselves (on a 10-point scale) using eight questions. Three questions pertained to their evaluation of the compliance (fidelity) with regard to the planned program: overall implementation, target clientele and intervention protocols. Meanwhile, the five other questions asked whether the following components of the program were conducive to its faithful implementation: documentation, clientele's participation, people who implement the program, support from the organization and partners. The results are presented in Table 1. The averages

Table 1 – Results obtained in the questionnaire on implementation, by component, for each center

	Evaluation of compliance (fidelity) (/10)				The component favors faithful implementation (/10)				
Centers	Overall Implementation	Target Clientele	Clinical Process	Documentation	Clientele's Participation	People who implement the program	Support from the organization	Partners	Average of the centers
2b	4	9	6	4	9	3	3	8	5.75
2a	7	9	5	4	9	5	0	7	5.75
12b	3	9	8	2	9	7	7	5	6.25
3	7	6	7	5		8	6	7	6.57
12a	7	9	8	2	9	7	7	5	6.75
1	7	7	7	8		7	7	6	7.00
4	8	5	8	5	9	7	8	7	7.13
7	8	9	9	3	8	7	7	7	7.25
15	9	5	9	8	7	8	7		7.57
10	7	9	9	8	9	7	8	6	7.88
5	8	9	8	8	7	8	8	8	8.00
6	9	5	9	6	10	9	8	8	8.00
14	9	6	9	9	7		8		8.00
8	8	9	8	8	9	9	8	6	8.13
9	8	8	10	4	6	10	10	10	8.25
2c	8	9	9	6	9	9		9	8.43
13	9	8	9	10	10	9	8	8	8.88
11	10	10	10	10	10	10	10	8	9.75
Avg	7.56	7.83	8.22	6.11	8.56	7.65	7.06	7.19	7.50
SD	1.72	1.69	1.31	2.61	1.21	1.77	2.38	1.38	1.08

reported in the right-hand column are the averages calculated for each center for the eight components evaluated. They enable us to compare the centers, which are classified in ascending order of their self-evaluation. The averages reported at the bottom of the table are those calculated by component for the 18 centers. They enable us to compare the components.

First, we notice a great variability in the centers' self-evaluations. The lowest scorers give themselves an average score of 5.75 on 10 for the eight components evaluated, while the highest scorer gives itself an almost perfect score of 9.75. We can see that despite the self-evaluation, several centers were rather severe when judging their own compliance (or fidelity) with the program planned by their center, as well as the contribution of various components in the faithful implementation of their EIBI program. Five of the 18 centers gave themselves a score below seven.

The scores that the centers gave themselves for compliant implementation (fidelity) are 7.56 for overall implementation, 7.83 for reaching the target clientele and 8.22 for the clinical process, respectively. Among the components related to the quality of the implementation, documentation (6.11) and support from the organization (7.06) received the lowest results on average for all the centers. Conversely, the components pertaining to the clientele's participation (8.56) and the people who implement the program (7.65) are the most positively evaluated components by the respondents.

By comparing the self-evaluation with the answers to the other questions, we can see that, regarding the intervention protocol and services offered, the centers that gave themselves the highest scores for the question on documentation mention the presence of documents describing their EIBI program. Inversely, the centers that gave themselves a lower score for this item mention the lack of documentation. Regarding the target clientele, the respondents having obtained the lowest results for the question on overall implementation still give themselves high scores for this question. They report quality services despite the fact that they do not reach all the children and that the number of hours of services is limited. Concerning the clientele's participation, the centers generally give themselves a high score. This means that they believe the clientele's participation (children and families) contributes to the implementation of the program. Moreover, the centers that gave themselves the highest scores mention parents' participation and collaboration as a facilitating element. With respect to the people who implement the program, among the institutions with the highest results, one respondent mentions the team's strong motivation. Among the respondents who gave themselves the lowest results, the issue is a lack of training, for caseworkers and supervisors alike. With regard to support from the organization, the lack of training is a recurring theme. Generally, the comments concerning the partners indicate variability in the centers' collaboration and participation.

6. Discussion

The first key finding further to this detailed description of the CRDITEDs' choices is the great diversity of practices after several years of implementation, as reported by Love *et al.* (2009) as well as Gamache, Joly and Dionne (2010). Notwithstanding the other aspects addressed below, we can see that the CRDITEDs' choices are nonetheless consistent with the broad principles of EIBI, despite the absence of specific documentation, guides or materials (especially Francophone), some difficulties related to human resources, or the fact that fewer hours than the prescribed 20 hours of services per week are provided. In fact, an analysis of the practices by center shows that the intervention is truly of an intensive, behavioral nature, based on one caseworker per child, in the child's natural setting. Furthermore, a few organizations seem to have risen to the challenge of implementing these complex interventions far better than some others have.

Several factors may account for this great diversity of practices. The first and not the least is the very absence of evidence-based implementation practices that favor compliant implementation of this type of program, as suggests the research by the National Implementation Research Network (Metz *et al*., 2013) among others. We are aware that we are now looking back on an implementation that began more than 10 years ago, at a time when there was still little talk about an implementation science. Nonetheless, the province of Quebec could have systematically evaluated the implementation from the beginning and used fidelity measures earlier, at least in a few centers on an experimental basis. Also, local implementation teams and a national team of experts should have been created to support the CRDITEDs, as proposed in fact by Fixsen *et al*. (2013). Another factor, not as well documented, however, is unarguably the diversity of the approaches to EIBI. To our knowledge, there are no studies to date that show that one protocol is more easily implemented than another. Should the province of Quebec have imposed one? But which one? It is not easy to make such a choice when even the scientific literature does not report any essential elements (independent variables) for judging the effectiveness of particular techniques (Lechago and Carr, 2008).

With regard to the people who implement the program, we know that the majority of those who work with the children hold a college diploma and that these people are perceived as enthusiastic about the EIBI program. As observed by Love *et al.* (2009), few have a certification in behavioral analysis, and some organizations offer only 15 hours or less of training when they hire these people. This is very little, considering the complexity of the program and the lack of documentary resources. Fortunately, they have supervision, but the practices in this regard vary greatly in nature and quantity from one

center to another. Yet, practices related to supervision, particularly its intensity, are linked to significant outcomes for the children (Eikeseth *et al*., 2009). All the people, without exception, must have sufficient training to apply the program faithfully. The ability to implement the program faithfully should be the criterion for judging each caseworker's training and supervision needs. But this becomes a major challenge, especially with staff turnover. Several organizations identified this last phenomenon as a major barrier to a compliant implementation of the program.

Researchers have paid little or no attention to the organizations' partners. In this study, we were able to identify them and to conclude that they vary, with daycare centers, social services centers, school communities and hospitals at the top of the list. This is desirable in a context of large-scale dissemination. It is, in fact, mentioned that one of the features of valid programs is the intervention in the child's natural environment (Hayward, Gale and Eikeseth, 2009). Meanwhile, parents participate in the EIBI program in varying degrees according to the CRDITEDs. Nonetheless, the collaboration mechanisms are not well known, and the part that each person plays in the intervention remains very unclear, even though the effect of parents' involvement is recognized (Hayward *et al*., 2009).

Regarding the intervention protocol, almost all the CRDITEDs offer from 11 to 20 hours of intervention per week. This is at the lower limit of what is prescribed for this type of program. These results are also in line with those of Love *et al*. (2009) and of Mudford *et al*. (2001), who had already found that the duration of interventions was below the standard, but in a program applied by parents. The issue of intensity is worrisome, in that its link to the effectiveness of EIBI has been demonstrated (Granpeesheh *et al*., 2009; Makrygianni and Reed, 2010; Viruès-Ortega, Rodriguez and Yu, 2013). Besides the intensity, the curricula used vary greatly, as do the assessment tools. As before, Love *et al*. (2009) had also noted such a situation. The project also revealed the emergence of a type of intervention combining behavioral and developmental approaches. Identification of this type of program, in addition to the one based solely on a behavioral approach, may lead caseworkers to reflect on the theoretical and conceptual foundations of their EIBI programs. Furthermore, the use of several curriculums and intervention strategies has advantages but also some consolidation challenges. In this regard, the lack of documentation reflecting this integration is mentioned and deplored by the respondents. Similarly, highlighting the variety of assessment tools used in EIBI programs could cause caseworkers and professionals to question the goals targeted during the evaluation process (e.g. selecting intervention objectives, assessing the effectiveness of the intervention) in order to choose these instruments according to their intended use. These choices are important because they guide the

selection of intervention targets for the child's intervention plan. In fact, the centers told us that documentation is one of the most problematic aspects for quality implementation. The production and promotion of common tools designed for a compliant application of the program should therefore be one of the priorities for administrators.

Finally, with regard to the target population, the main problem is assuredly the presence of waiting lists in several centers. Reported waiting times vary from 4 to 24 months according to the CRDITEDs. This can have major consequences by lessening the effectiveness of early intervention. Indeed, several studies have shown that one of the variables associated with the effectiveness of EIBI is the child's age at the start of the intervention (Flanagan, Perry and Freeman, 2012). Access to specialized services should thus be increased through various means, notably by reducing the number of children waiting for services and through earlier screening of children.

7. Conclusion

Considerable sums (approximately $25 million annually) are invested in Quebec in the implementation of the EIBI program for children with ASD. This program has spread quickly throughout the province. Difficulties were encountered and some persist, but there were also innovations. After more than a decade of experience in implementing the program, some work defining the program is required. Implementing the provision of EIBI services, outside specialized research centers, on a large scale and in everyday intervention conditions, is the trademark of the Quebec model. However, there is little written documentation on the use of intervention strategies differentiated according to the children's characteristics and the intervention targets. The use of several curricula and intervention strategies has advantages but also some consolidation challenges. In this regard, the lack of documentation reflecting this integration is deplored. This situation presents multiple drawbacks. The absence of clearly defined programs affects program quality and implementation fidelity. Additionally, the transfer of expertise to new caseworkers is greatly complexified. In terms of evaluating the effects of EIBI, a description of the intervention program remains essential information. There is a near-consensus to the effect of developing a true implementation science to bridge what is commonly known as the research-practice gap, even in the field of autism (Fixsen *et al*., 2013; Odom, Cox and Brock, 2013). This is not foreign to the fact that the evidence-based practices were developed from a top-down perspective where the focus was on effectiveness demonstrated in ideal experimental conditions (to maximize the internal validity of the studies), but

often to the detriment of viable validity, which refers rather to the capacity to implement these programs in the real world (Chen, 2015). It is important to contribute to the development of an implementation science relying on viable validity. A reflection is needed on the evidence-based practices, developed in ideal experimental conditions that often have little to do with the reality of the contexts where these interventions are implemented. Therefore, the program theory could be formulated based on: 1) existing studies or theories, 2) the decision makers' explicit or implicit theories, 3) observations of the program in action or exploratory studies, and 4) a combination of the previous items. In sum, it is a matter of supporting the adaptation of the EIBI program for 2- to 5-year-old children with ASD by clarifying the program theory for a shared, reliable dissemination of the principles of EIBI. This does not mean reinventing EIBI, but rather reconciling best practices and viability in practice environments. Concerning the research community's formalization of an innovation observed in the field with a view to a transfer to other interested environments, two characteristics are required to qualify the practice of the EIBI program as innovative (see Figure 1). The first is the adoption of a combined developmental and behavioral approach in some CRDITEDs. More specifically, the evaluation approach for this project is the integrative validity model (Chen, 2015). This evaluation approach focuses on: 1) the way the intervention is implemented, 2) the way to improve the intervention based on the implementation experience, and 3) the way to "formalize or standardize" it. This bottom-up approach reflects the stakeholders' perceptions and concerns more adequately and is a more appropriate alternative for evaluating programs in the field of social services, at every step in program design and implementation.

This study has enabled us to describe the choices made by the large majority of the centers mandated by the province of Quebec to offer a free, universal EIBI program to children under 6 years of age with ASD. It confirms the diversity of choices; however, despite this diversity and major implementation challenges, we can see that great efforts have been made to adhere to the principles of EIBI. This study thus contributes, albeit modestly, to the advancement of the emerging Implementation Science by describing the organizations' choices, a major, yet barely studied, link in the implementation of such complex programs. Like the one by Love *et al*. (2009), this study confirms the diversity of the practices. Next, we must try to understand.

To do so, we need a more detailed portrait of the clinical process as currently applied in the centers by caseworkers. It is also relevant to document the various models of supervision proposed by the centers, while putting into perspective their respective advantages and limitations. Also, parental participation and involvement in EIBI programs are a research theme worth

pursuing. In fact, a better understanding of parents' expectations regarding the program and their participation, but also of the advantages that they derive from it or the associated challenges, could provide a glimpse into the various possibilities in terms of which services to offer. It would also be relevant to better document the partnership and link between the specialized institutions offering EIBI programs and the daycare centers, schools or CSSS.

Finally, this study presents major limitations. The first is unarguably the fact that all the data are self-reported, including the data on implementation quality and fidelity. Observation data and validated tools are necessary. The size of the sample appears small, but the study still covers more than two thirds of the centers that offer services in Quebec. Finally, the data presented here were obtained from supervisors or department heads; it is possible that the actual practices used with the children also differ from the ones reported by the center.

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