

## The Importance of Evaluating Training Programs Aimed at the Identification of Early Markers of Autism Spectrum Disorder (ASD)

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### Abstract

In recent years, knowledge about the early manifestations of Autism Spectrum Disorder ASD has increased significantly. This has given children the potential benefit of receiving the earliest possible interventions, which contribute to reducing the risk of more serious manifestations of symptoms and to improving the prognosis. Nonetheless, late diagnosis is still a worldwide reality. For this reason, developing strategies for identifying early markers has been considered one of the priorities of ASD research, principally within the public health context. Accordingly, the present study's objective is to discuss the importance of developing training programs focused on early identification of ASD in public health, programs that are founded upon the following processes: (a) identification of qualitative differences in the social communication and behavioral development of children with suspected ASD; (b) consideration of developmental surveillance principles in conjunction with developmental and neurodevelopmental theoretical concepts; and (c) assessment of such programs' effectiveness within the context of the human sciences.

**Keywords:** Autism disorder, effectiveness, public health, Autism Spectrum Disorder, training program, early markers.

### A Importância da Avaliação de Programas de Capacitação para Identificação dos Sinais Precoces do Transtorno do Espectro Autista – TEA

### Resumo

Nos últimos anos, o conhecimento acerca das manifestações precoces do Transtorno do Espectro Autista (TEA) tem aumentado significativamente. Isso tem oportunizado à criança um benefício

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quanto à possibilidade de intervenções o mais cedo possível, as quais contribuem reduzindo o risco da manifestação mais grave dos sintomas e melhorando o prognóstico. No entanto, o diagnóstico tardio ainda é uma realidade mundial. Por esse motivo, desenvolver estratégias para o reconhecimento de sinais precoces tem sido considerado uma das prioridades na pesquisa em TEA, principalmente no contexto de saúde pública. Dessa forma, a presente pesquisa tem como objetivo construir uma linha de argumentação sobre a importância de se elaborar programas de capacitação em identificação precoce do TEA em saúde pública, ancorados nos seguintes fatores: (a) Identificação das diferenças de natureza qualitativa no curso do desenvolvimento sociocomunicativo e comportamental de crianças com suspeita de TEA; (b) consideração dos princípios da vigilância do desenvolvimento infantil articulados aos conceitos teóricos desenvolvimentistas e neurodesenvolvimentais e (c) avaliação do programa, com base na aplicação dos princípios de efetividade, no contexto das ciências humanas.

**Palavras-chave:** Transtorno autístico, efetividade, saúde pública, Transtorno do Espectro Autista, programa de capacitação, sinais precoces.

## **La Importância de la Evaluación de Programas de Formación para Identificación de los Signos Tempranos del Trastorno del Espectro Autista – TEA**

### **Resumen**

En los últimos años, el conocimiento acerca de las manifestaciones precoces del Trastorno del Espectro Autista (TEA) han aumentado significativamente. Esto ha posibilitado a los niños un beneficio cuanto la posibilidad de intervenciones lo más temprano posible, las cuales ayudan a reducir el riesgo de la manifestación más severa de los síntomas y mejoran el pronóstico. Por este motivo, desarrollar estrategias para el reconocimiento de las señales precoces ha sido considerada una de las prioridades en la pesquisa en TEA, principalmente en el contexto de la salud pública. Por lo tanto, esta investigación tiene como objetivo construir una línea de argumentación sobre la importancia de establecerse programas de capacitación en el reconocimiento precoz de los TEA en la salud pública, fondeados en los siguientes factores: (a) las diferencias de naturaleza cualitativa en curso del desarrollo socio-comunicativo de niños con sospechas de TEA; (b) consideración de los principios de vigilancia del desarrollo infantil y de la psicología del desarrollo humano, articulados con otros campos del conocimiento en la propuesta del programa, con una especial atención en los conceptos desarrollistas y neurodesarrollados (c) la evaluación del programa, basado de la aplicación de los principios de efectividad, en el contexto de las ciencias humanas.

**Palabras clave:** Trastorno autista, efectividad, salud pública, Trastorno del Espectro Autista, programa de capacitación, signos precoces.

Autism Spectrum Disorder (ASD) is considered a neurodevelopmental disorder characterized by (a) persistent deficits in communication and social interaction across multiple contexts, such as deficits in social-emotional reciprocity, deficits in non-verbal communication behaviors used for social interaction, and deficits in developing, maintaining and understanding relationships; and (b) restricted, repetitive patterns of behavior, interests or activities with impairments

in adaptive functioning. The early markers may appear during the first three years of life and their nature is not entirely explained by the incidence of intellectual disability (DSM-5, American Psychiatric Association, 2014).

Early markers that are most closely associated with a subsequent autism diagnosis include the following: abnormalities in establishing eye contact and in directing a partner's attention to a focus of common interest (e.g., pointing and

showing) during social interaction; coordination between gestures and facial expressions/postures in the course of communication; a reduced amount, or total lack, of imaginative play, and repetitive or ritualized behaviors related to the body (e.g., mannerisms and other complex movements), to speech (echolalia, verbal rituals) or to the use of objects (flipping or lining up objects, etc.); and sensory alterations (hyper- or hyporeactivity to sounds, lights and movement; Ministry of Health, 2014). Also along the lines of early ASD detection, a multicenter study of clinical indicators for risks in child development stands out. Based on the study, an instrument (known as IRDI) was developed that is made up of 31 clinical indicators of cognitive developmental problems observable during an infant's first 18 months of life. The instrument addresses maturation processes of a neurological and genetic nature and processes that make up the psychic subject. Based on such research, the researchers were able to pinpoint clinical symptoms that signpost delays in, or the absence of, processes that should be underway. Among such symptoms, the lack of imaginative play, for example, reveals an interruption or lack of the mechanism of fantasy as an instrument for dealing with the difficulties all children face when growing up and indicates a significant detriment of development (Kupfer et al., 2009).

Early detection of ASD signs, or early markers, within the first few years of life (within 36 months), is one of the priorities of ASD research; it involves knowledge as to the development of factors associated with social cognition, factors that can manifest themselves in a subtle manner throughout the course of childhood development (Ozonoff et al., 2010). Along these lines, in recent years, Bosa (2002, 2009) called attention to the possibility that the initial difficulties exhibited by some ASD children manifest themselves in extremely subtle ways, particularly when such children are very young or when they are not seriously impaired. Bosa also called attention to various other factors that can retard the detection of "early markers," factors such as parents and specialists' lack of knowledge concerning the milestones of social communication devel-

opment. In this respect, several authors contend that ASD is more a qualitative developmental deviation than a developmental retardation (Bosa, 2009; Kupfer et al., 2009). Such deviations denote both the atypical manifestation of a specific behavior (e.g., stereotypies) and the absence of abilities that are normally observed (e.g., joint attention) in each age group. In fact, Daniels and Mandell (2014) conducted a critical review of the literature on the subject, seeking to identify factors that seem to influence the age at which the diagnosis is made, and they found that children with Asperger Syndrome or global developmental disorders tend to be diagnosed later than ASD children are. Along these lines, a study conducted by Zanon (2016) produced evidence to the effect that the severity of the symptoms appears to anticipate the recognition of developmental deviations.

Awareness of the presence of early markers of Autism Spectrum Disorder (ASD) has led to timelier interventions, much to the child's benefit (Zwaigenbaum, Bryson, & Garon, 2013), contributing not only to decreasing the risk of graver manifestations of the symptoms during childhood development, but also to improving the prognosis (Dawson, 2008; Helt et al., 2008).

Nonetheless, despite the increase in such awareness, many ASD children are still not identified prior to beginning their school years (Shattuck et al., 2009; Zuckerman, Lindly, & Sinche, 2015), although many parents suspect socio-communicative developmental problems as early as the first two years of their children's lives (Zanon, Backes, & Bosa, 2014).

One of the hypotheses to explain the delay in detecting early markers is pediatricians and healthcare professionals' lack of training in relation to both clinically identifying ASD and employing screening instruments (Wilkinson, 2011; Ws, Zwaigenbaum, Nicholas, & Sharon, 2015). For this reason, several programs have been developed with the objective of training healthcare professionals to identify ASD early markers (Barbaro, Ridgway, & Dissanayake, 2011; Bordini et al., 2015; Steyer, 2016).

Such programs are commonly referred to as training or "capacity building" programs, al-

though there are debates over the various terms that should be employed (Tachizawa, Ferreira, & Fortuna, 2001). In the present study, training means preparing people to perform the tasks that are inherent to their work, by way of the application of knowledge, while simultaneously seeking to develop competence. In turn, competence refers to that which results from knowledge, ability and attitude (Fusari, 1988). Accordingly, in relation to developing competence, the objective of capacity building is to provide autonomy, self-confidence and creativity through the effective application of knowledge, problem solving and achievement of proposed results (Mussak, 2010). In the area of ASD, both in Brazil and abroad, the majority of such programs are aimed at primary care professionals with a college degree in health (doctors and nurses; Barbaro et al., 2011; Bordini et al., 2015). Studies have demonstrated that, subsequent to receiving such training, health professionals identified a larger number of ASD children with early markers than they did prior to taking the program (Barbaro et al., 2011; Bordini et al., 2015; Steyer, 2016; Swanson et al., 2013).

Notwithstanding such findings, few studies have been conducted with the aim of assessing the results, describing the methodologies and presenting the theoretical foundations of such programs (Barbaro et al., 2011; Steyer, 2016). On the other hand, there is concern over the consequences of proposing programs in this area, especially with respect to the increased number of referrals of children with suspected developmental difficulties in areas encompassed by ASD (Zwaigenbaum et al., 2015). The risk is that inadequate referrals cause unnecessary worries on the part of parents and lead to demand that exceeds health systems' capacity to effectively meet such demand.

From this standpoint, it is worth stressing the importance of developing programs for identifying ASD early markers that encompass not only the early markers, but also detailed information concerning the milestones of social development during infancy and early childhood, in such a way that they constitute typical param-

eters of social communication development and child behavior.

The aim of the present study is to argue about the importance of developing training programs focused on building the capacity to identify the early markers of ASD in public health in Brazil. Those programs should be based on the following processes: (a) identifying qualitative differences in the course of the social-communicative and behavioral development of children with suspected ASD; (b) considering developmental surveillance principles together with developmental and neurodevelopmental concepts; and (c) assessing the programs, based on the application of effectiveness principles, within the human sciences context.

Having previously discussed the principal ASD early markers, with emphasis on the qualitative differences in social-cognitive skills, we will next discuss the following topics: the parameters of typical child development and their theoretical foundations; the neurodevelopmental approach; and the developmental surveillance approach in Primary Care.

### **Parameters of Typical Child Development: Theoretical Foundations**

We will first discuss social-communicative development concepts, which are based on Michael Tomasello's social-pragmatic theory and are associated with neurodevelopmental concepts. Comprehension of the manner in which such processes take place in typical child development is the key to understanding the flaws in this process.

#### ***Social-Cognitive Development***

Tomasello (1999/2003) formulated the Social-Pragmatic Theory, which describes various types of behavior associated with social development and language acquisition during the first few years of life. According to him, throughout the course of evolution, human beings have developed a new form of social cognition that enables individuals to perceive other people as beings with mental, intentional lives that are

equivalent to their own lives. Perceiving oneself and other people as intentional agents whose behavioral and attention strategies are organized along the lines of goals makes it possible for processes involving children's social learning and adaptation to their social environment to take place. In other words, in order for children to comprehend a tool or symbol's conventional use, they need to be able to grasp the intentional meaning of the tool or symbol's use (i.e., the purpose that "we," the users of such a tool or symbol, attribute to the use we make of it; Tomasello, 1999/2003, p. 7).

The development of such cognitive competence promotes processes of identification with other people; in turn, such processes are essential for social-cognitive adaptation. Tomasello (1999/2003) also contended that such cognitive comprehension does not emerge all at once in human ontogenesis. Prior to developing this ability, at approximately 6 months of age, a baby's interactions with objects or people are still largely dyadic; that is, babies are interested in objects or toys, and they handle them while ignoring the presence of the persons around them. It is only at the age of approximately nine months that infants begin manifesting, in a more evident manner, a series of new behaviors that appear to indicate that a transformation has occurred in the way they comprehend objects, other individuals and themselves. One of the behaviors that evidence such a change arises when infants start displaying interest in following an adult's gaze; as of that moment, they begin taking part in comparatively lengthy sessions of social interaction mediated by events or objects. In such circumstances, infants use adults as social reference points and begin treating objects in the same way that adults do.

In fact, there is empirical evidence for such a notion, particularly in studies focusing on infants at high risk of ASD (siblings of ASD children) that tested hypotheses associated with the manifestation of atypical patterns of social attention on the part of such infants prior to 12 months of age (Ozonoff et al., 2010). Hypotheses along these lines affirm that such infants are less interested in human faces than low-risk

infants (in this case, infants manifesting typical development) are. Recently, in an eye-tracking study, Chawarska, Macari, and Shic (2013) observed reduced social attention in 6-month-old babies who were subsequently diagnosed with ASD. The results showed that such babies looked considerably less at people in a setting that also included toys than did babies who were not subsequently diagnosed with ASD.

From the standpoint of typical development, perception of oneself and of others as intentional agents is gradually manifested in a more complex manner insofar as infants begin to actively employ the cultural tools that such perception enables them to master, such as the use of gestures (i.e., pointing, handing, showing, etc.; Tomasello, 1999/2003). In other words, infants only learn to make gestures if they perceive themselves and others as beings that are endowed with communicative intent.

Such ability makes it possible for a child, during the second semester of life, to take part in triadic social interaction, whereby the child and the adult regulate each other's attention, sharing their interest in relation to a third referent (i.e., object, event, symbol). This group of behaviors is known as Joint Attention - JA (Tomasello, 1999/2003). With the JA experience as a starting point, a child begins developing comprehension of communicative intent and constructing the social-cognitive foundations of language acquisition. Children's perception of communicative intent in an adult's actions thus enables them to culturally mediate their comprehension of the world because it makes it possible for them to engage in learning processes and internalize other people's viewpoints. One of children's first cultural learning processes occurs through imitation, when a child assimilates the conventional use of cultural tools and artifacts, discerning the underlying objectives of other people's actions. When children imitate, they not only replicate adults' actions, but also imitate their behaviors, comprehending the adults' objectives and sharing such goals. When such complex comprehension does not take place, simple motor replication of another person's act is not genuine imitation, but rather emulation, a

skill that is also manifested in animals, such as primates (Tomasello, 1999/2003).

These are the pre-linguistic and social foundations of a more complex ability that develops around four years of age – Theory of Mind (ToM). Generally speaking, ToM refers to a child's capacity to comprehend his/her own mental states (thoughts, beliefs, desires and emotions) and those of other people (Baron-Cohen, Leslie, & Frith, 1985; Domingues & Maluf, 2008; Wimmer & Perner, 1983). Nonetheless, as of 24 months of age, a child already exhibits the basics of such a skill, when engaging in symbolic play (Lyra, Roazzi, & Garvey, 2008; Sperb & Carraro, 2008). Play is directly related to the development of language (both expressive and receptive) and social relations, including peer engagement (Naber et al., 2008). Christensen et al. (2010) described three play-related domains: sensorimotor manipulation and exploration, functional play, and symbolic or imaginary play. Sensorimotor manipulation and exploration involves the simple manipulation of objects, or play focused on the physical attributes of objects, while functional play is the appropriate use of an object or the conventional association of two or more objects, such as a spoon to feed a doll. Meanwhile, symbolic play is characterized by an underlying complex representation of objects, and thus the ability to pretend an object is present when it is not or to extend the function of one object to another object. Accordingly, symbolic play is often demonstrated through one of three types of actions: substitution (or the use of one object as another); imaginary play (the attribution of false properties to an object or the imagined presence of an absent object); and agent play (in which a doll or similar object becomes the agent of an action). Children's play behaviors thus reveal the level of mental sophistication with which they are interacting with their environment and the extent to which they comprehend and can represent the world around them, being capable of putting themselves in the other person's shoes. The complexity of their social development also depends on satisfactory functioning of the brain in constant interaction with the environment.

### *Neurodevelopmental Approach*

The brain network responsible for social development is made up of structures that are involved in the processing of social information, of emotion and of social behavior itself, as has been shown by studies involving human beings and animal models (Dawson, 2008). Children are capable of processing external visual and auditory stimuli long before developing their motor skills, which enable them to engage in sensory exploration of the physical environment. Babies gradually assimilate information from various sensory systems in such a way that they develop the sensory ability to detect discrepancies and novelties that are part of their explorations. In turn, such sensitivity enables babies to concentrate their attention on the novelty, instead of avoiding it. Naturally, such sensitivity is contingent upon adequate stimulus levels, without which babies become hyper or hypo stimulated. During an infant's initial phase of social interaction, the sensory ability to maintain one's focus of attention on the eyes of one's caregiver opens the doors to a series of other increasingly complex abilities (Chawarska et al., 2013). Chawarska et al. also reported that there is evidence to the effect that, from an early age, children process social information based on their perception of facial expressions, above all their perception of people's eyes. Accordingly, when children engage in social interactions, they continuously monitor the other person's behavior and adapt their own behavior to the other person's reactions. From the standpoint of Neuropsychology, the ability to adapt one's behavior in response to feedback is one of the key functions of the prefrontal cortex, known as executive functions, and is the basis of flexible goal-directed behavior (Uehara, Mata, Fichman, & Malloy-Diniz, 2016). The opposite of flexible behavior is rigid behavior and, for example, perseveration in activities of one's own sensory interest (Bosa, Czemainsky, & Brandão, 2016; Dawson, 2008). Executive processing entails inhibiting irrelevant or competing processes and information, focusing attention on relevant information, programming processes aimed at complex tasks, planning sub-task sequences, and monitoring performance (Hamdan & Pereira,

2009). Executive functions are an ample construct that encompasses elaborate cognitive processes, responsible for the control, integration, organization and maintenance of diverse cognitive skills (Chan, Shum, Touloupoulou, & Chen, 2008). The proper functioning of the skills managed by executive functions makes it possible to engage in adaptive, self-organized, goal-oriented behaviors.

In fact, in this respect, the social communication difficulties of people with ASD are typically accompanied by difficulties in cognitive and neuropsychological processes associated with executive functions (Christ, Kester, Bodner, & Miles, 2011). Neuropsychological research has discovered evidence of a pattern of behavioral inflexibility and perseveration and of difficulties in inhibitory control in such people (Christ et al., 2011; Czermainski, Bosa, & Salles, 2014; Godefroy, 2003; Pennington & Ozonoff, 1996). Such difficulties support the hypothesis that ASD involves the impairment of executive functions. This hypothesis resulted from the observation of similarities between the behavior of people with frontal cortex lesions and the behavior of individuals with ASD. Hence, the impairment of executive functions in people with ASD could partially explain the existence of restricted, repetitive behaviors and interests (Hill, 2004), such as a child's insistent interest in playing with a single toy or parts of it, always in the same manner, or a child's difficulty to modify his/her own routine.

It is possible to assess social communication skills, behavioral flexibility and the capacity to deal with diverse stimuli, mainly by way of observing the behaviors a child exhibits in the course of interactions predominantly involving play. Such observation takes time and requires systematic monitoring by specialists experienced in both typical and atypical development. That is why there are those who contend that the developmental surveillance approach could be an effective primary-care strategy for identifying ASD early markers, given that, in contrast to what occurs at screening appointments, the examiner is trained to systematically observe the child's behavior on more than one occasion and

is prepared to attach the parents or guardians' concerns to his/her observations (Barbaro et al., 2011).

### *Developmental Surveillance Approach in Primary Care*

One of the contexts for identifying the early markers of Autism Spectrum Disorder (ASD) is primary care, which is the first level of access to health care. At the international level, "Primary Health Care" (PHC) has been presented as a healthcare-organizing strategy designed to meet the major part of a population's health needs in a regional, uninterrupted, systematic manner, incorporating preventive and remedial measures as well as attention to individuals and communities (Matta & Morsini, 2009). In Brazil, the strategy for organizing primary health care is part of a program known as Family Health, whose activities are conducted by multidisciplinary teams made up of family physicians and nurses as well as professionals with technical training and/or a high school education ("community health agents" [CHAs] and nurse technicians). Community health agents provide preventive, remedial and rehabilitative care, in addition to promoting health actions (Ministry of Health, 2012). Furthermore, in light of the fact that this policy requires CHAs to make monthly visits to the homes of infants up to the age of 24 months, these professionals have the opportunity to assess such infants in their natural environment, employing the developmental surveillance approach as a unifying principle of health care (Figueiras, Puccini, Silva, & Pedromônico, 2003; Ribeiro, Silva, & Puccini, 2010).

In the public primary care network, developmental surveillance of children can be an effective instrument for detecting early markers of ASD because it guarantees systematic monitoring of children throughout the course of their development. In light of the fact that in the majority of countries children between the ages of 0 and 6 years enjoy regular visits to primary care facilities to monitor their growth and development, researchers have strived to devise strategies for such facilities to identify children at risk of ASD (Williams & Brayne, 2006).

In Australia, Barbaro et al. (2011) performed a study focused on training nurses who work in a health program that monitors child development between the ages of 0 and 36 months. In this study, 241 maternal and child health nurses received training as to the early markers of ASD at 8, 12, 18 and 24 months. Employing a developmental surveillance approach, a cohort sample of 20,770 infants was monitored in relation to social attention and communication behaviors from September 2006 to June 2007. The sample was composed by 89 infants who were diagnosed with ASD within 24 months, and 20 were diagnosed with developmental and/or language delays, leading to a positive predictive value of 81%. The estimated ASD rate in the cohort study of communication and social attention varied between 1:119 and 1:233 children. That being the case, the study concluded that the developmental surveillance of social and communication behaviors, which vary according to the child's age at the time of monitoring, enables one to identify infants at risk of ASD between 12 and 24 months of age. The study's authors proposed training in early markers for all primary health care professionals because it facilitates early ASD identification. Seeking to aid this proposal, the authors validated a social communication behavior surveillance scale (known as SACS, or Social Attention and Communication Surveillance) aimed at guiding health agents in the assessment of children during follow-up visits (Barbaro & Dissanayake, 2012).

Canada is another country that has been employing the developmental surveillance approach as a strategy in policies focused on ASD. In 2012, the first report of the National Epidemiologic Database for the Study of Autism in Canada (NEDSAC; Coo et al., 2012) was partially concluded. The program was launched in 2001 by a consortium made up of 14 Canadian institutions, including university departments and regional health centers. Regional teams collected data concerning ASD children in six Canadian provinces: British Columbia, Calgary, Manitoba, Ontario, Prince Edward Island, and Newfoundland and Labrador. The study's objective was to estimate the prevalence of

ASD among Canadian children and to register the ages (at the time of diagnosis) of those with ASD. The researchers believed such data would aid health, education, and social care sectors to plan courses of action and allocate funds.

The findings show that scientific research and health surveillance can serve each other by collaborating toward the development of public policies aimed at minimizing the harm occasioned by developmental disorders such as ASD. Furthermore, the results of those studies clearly evidence the possibility of early detection of ASD in primary care, which is the focus of the present research project. The primary care panorama in Brazil and the actions implemented as of 2012 by the Brazilian Ministry of Health with respect to the theme are presented below.

### **Training Programs in the Early Identification of ASD and Public Policies on ASD: The situation in Brazil**

Brazil's National Policy for the Protection of the Rights of Persons with Autism Spectrum Disorder (Law no. 12,764 of 12/27/2012) is still relatively new, as are government programs focused on the health of people with ASD (Ministry of Health, 2014, 2015). Thus, Brazilian health professionals' knowledge regarding ASD is still quite limited.

To date, only one pilot study has been published in Brazil, presenting the results of an ASD training program for primary care physicians (Bordini et al., 2015). Similar to the findings of studies in other countries, the Brazilian study found that the training program modified physicians' clinical practice, stimulating an increase both in the number of referrals of ASD-suspected children for specialized services and in professionals' knowledge as to ASD early markers. During the four months preceding the training program, only one child with suspected ASD had been referred to a specialized service; subsequent to the training course, the same service received six referrals of children exhibiting behavioral impairments that are diagnostic criteria for ASD. Another study (Steyer, 2016) that



sought to assess the program's results administered the training course to Community Health Agents (CHAs) and discovered indications of effectiveness based on measures of satisfaction and of knowledge transfer: Within 4 months of completing the training course, the CHAs identified early markers of ASD in 2 children.

Given that the organizational strategy for primary health care in Brazil is part of the Family Health program, whose activities are conducted by multidisciplinary teams, CHAs can play a central role in early ASD detection since their work constitutes the first level of a family's access to health care. CHAs' responsibilities involve preventive, curative and rehabilitative care and the promotion of health actions (Ministry of Health, 2012). Moreover, considering that the program requires CHAs to make monthly visits to the homes of infants up to the age of 24 months, they are given the opportunity to assess such infants in their natural environments, employing the developmental surveillance approach as a unifying principle of health care. In turn, this principle encompasses activities related to promoting typical development and to detecting deviations in the developmental process (Figueiras et al., 2003; Ribeiro, Siqueira, & Pinto, 2010).

The proposal is consistent with the Guidelines for Care in the Rehabilitation of People with Autism Spectrum Disorders (Ministry of Health, 2014), which provide a list of indicators of typical development as support material for detecting early markers during developmental surveillance in primary care.

Proposing an ASD early-detection training program for CHAs thus requires combining health care with the conceptual foundations and systematization of such knowledge so that it satisfies the requirements of the actions stipulated in public health policies. It is also fundamental to bear in mind that, due to the scarcity of child development-related content in Brazil and the lack of investments in this area by Brazil's Ministry of Health (Zeppone, Volpon, & Del Ciampo, 2012), it is important to determine whether such initiatives have actually satisfied the population's health needs. In other words, it is not

sufficient to merely offer and guarantee access to training programs for professionals, but rather to combine such measures with specific methodologies aimed at assessing the effectiveness of such actions. Nonetheless, the methodologies themselves must likewise enjoy conceptual support, that is, within the scope of a given definition of effectiveness.

### **Principles of Effectiveness and Assessment of Programs within the Human Sciences Context**

The concept of effectiveness is frequently confused with the concepts of efficacy, efficiency and even quality, as Silva and Formigli (1994) phrased it in a classic review of such concepts. As stated by the authors, these three concepts are generally defined in the following manner in Portuguese language dictionaries: Efficacious is "that which produces the desired effect"; efficiency is the "action, force and virtue of producing an effect"; and effective is that which is "manifested through a real effect." That being the case, one can presume that the concept of effectiveness would be the sum of the concepts of efficacy (the capacity to achieve goals) and of efficiency (the employment of resources to achieve such goals). Effectiveness would denote that a given training program transformed an existing situation; that is, it produced an actual influence on the knowledge and work routine of those who received such training, by way of the attainment of the proposed objectives and goals (efficacy), employing resources in such a way as to produce the desired result (efficiency) in an uncontrolled context. In the personnel management field, the concept of effectiveness has been developed based on literature related to the assessment of programs involving training, development and education (TD&E); Pilati, 2004). Nonetheless, there are still relatively few studies in Brazil in the field of scientific research in Psychology in the area of human resource management and education (Scorsolini-Comin, Inocente, & Miura, 2011), although there is general agreement that assessment is an integral part of the chain of actions involving a TD&E

program because it provides information for its qualification.

In this manner, due to various factors that can potentially influence a training program, assessment of the program's effectiveness is as important as the training itself (Hamblin, 1978; Kirkpatrick, 1976; Pilati & Borges-Andrade, 2004). There are two ways to assess a health training program's effectiveness based on the transformations the program produces in the situation it influences, known as "impact and reaction." Impact refers to actual alterations in the situation, such as alterations in the variation of disease incidence rates, while reaction relates to changes in the individuals that implement the actions and to the institutions with which they are associated (Draibe, 2001). In a one-off, specific training program, such as the one developed for the present study, assessment of the reaction will produce results that are more significant in relation to evidence of effectiveness because the impact on the institution will still be localized and initial.

It has been argued for decades in the health field that the most suitable model for evaluating effectiveness is that which centers not only on the end result, but also on the process (Donabedian, 1992; Hamblin, 1978). Evaluating the process involves constantly assessing the established plan, in such a manner that it can be modified in accordance with the dynamics and needs of the target population; it also involves assessing the participants' satisfaction in relation to two factors: the quality of the program and the performance of the instructors. Satisfaction with the program can be evaluated in relation to various facets of the program, including the formulation of objectives and their compatibility with the training course; the workload and the suitability of the program's content; the quality and organization of the teaching material; the possibility of employing the acquired knowledge in the work environment; and perceptions as to potential improvements in individual performance. With respect to satisfaction with the performance of the instructors, various factors are considered, such as the degree of profundity with which the content is presented, the transmission of objectives,

the quality of the presentation of the content, the use of concrete examples that make it possible to comprehend the content, and the employment of diverse teaching instruments and resources so as to ensure quality training (Abbad, Gama, & Borges-Andrade, 2000).

Hamblin's (1978) model consists of five levels of evaluation of training: reaction, learning, on-the-job behavior, organizational effects, and ultimate value. Nonetheless, psychological research into the evaluation of training or capacity building has traditionally examined the levels of reaction, learning and on-the-job behavior (Abbad, Pilati, & Pantoja, 2003). The reaction level is studied based on the measurement of the participants' satisfaction, while the levels of learning and on-the-job behavior are assessed in terms of knowledge transfer and of the influence that the information taught has on the participant's overall performance subsequent to the training (Scorsolini-Comin et al., 2011). It is contended that the latter two aspects are vitally important, above all for the assessment of public health programs, because they make it possible to conduct a thorough analysis of the cost-benefit ratio of the actions.

That being the case, it is worth stressing that the evaluation of ASD early markers requires that the information taught be based upon clear-cut conceptual foundations precisely because community health agents' educational levels are quite different, including their schooling. Accordingly, with respect to offering training programs, it is necessary to combine two essential factors: (a) the development of specific educational and audiovisual resources that make allowances for the CHAs' different schooling levels and their specific occupational setting, namely, home visits; and (b) the development of methodologies focusing on assessing the effectiveness of such programs, especially focusing on assessing the transfer of knowledge within the specific work context. In order to do this, all of the proposed program's preparatory phases, from the initial contact with the public service to discuss the proposed training course to the elaboration of instructional and evaluative material, should give special attention to the result assess-

ment model. Consequently, once the program's effectiveness has been confirmed, its replication will be easier.

Within the capacity building context, learning is defined as the effective on-the-job application of knowledge, abilities and techniques acquired during training and their subsequent maintenance over a certain period of time (Cheng & Ho, 2001). It is employed as an important indicator of effectiveness based on the analysis of the dimensions of the process. When associated with the analysis of other indicators that correspond to other training evaluation levels, such as reaction, learning is an indicator that can lead to the validation of assessment models based on empirical evidence, which will contribute to the systematization of such knowledge, from the standpoint of its use by health managers and health professionals (Hartz & Silva, 2005; Silva, 2014).

When such concepts are judiciously incorporated into the methodology, they can facilitate the development, implementation and assessment of evidence-based programs of continuing professional education in the area of ASD. This is a provision that aids the validation of the proposed program, facilitating its replication in other primary care contexts.

### **Conclusion**

Although still in the initial stages of development, studies concerning the assessment of ASD early-detection programs have shown that training courses for health professionals foster the identification of children at risk of ASD (Barbaro et al., 2011; Bordini et al., 2015; Steyer, 2016; Swanson et al., 2013). Such studies also furnish important information for setting priorities and reorienting practices in primary health care so as to promote the early identification and prevention of developmental problems in children.

The review also revealed the difference between Brazil and countries like Australia and Canada with respect to the importance of developmental surveillance as a strategy in programs focused on ASD: Although several

Brazilian initiatives exist, such as the National Policy for the Protection of the Rights of Persons with Autism Spectrum Disorder (Law no. 12,764 of 12/27/12) and the Guidelines for Rehabilitation Care (Ministry of Health, 2014), Brazil lacks both the connections between health, education and social services and the investments that are observed in those countries.

Regarding the importance of identifying the qualitative differences in the social communication development and behavior of children with suspected ASD, there has been disagreement as to the theoretical and practical usefulness of developmental and neurodevelopmental concepts in training programs in this area. Tomasello's social cognitive theory describes the behavioral repertoire present in communication and social interaction in early infancy and explains its origin and course in development. Along these lines, such behaviors and skills are developmental parameters that aid health professionals to recognize eventual qualitative deviations and/or delays (which can range from slight to severe) in their manifestation. One of the limitations of this approach is that Tomasello's studies concentrate more on the social communication skills of infants over one year of age than on those of younger infants. Nonetheless, the social communication skills (e.g., joint attention) discussed by the author are those that display the most empirical evidence of being ASD "early markers" (Ozonoff et al., 2010). With respect to neurodevelopmental concepts, the concept of executive function, among other factors, contributes to comprehending behavioral rigidity as the antithesis of behavioral flexibility, creativity and the ability to deal with various stimuli (Sanders, Johnson, Garavan, Gill, & Gallagher, 2008), including social stimuli. Together with the principles of developmental surveillance, such concepts have formed a solid, coherent theoretical basis that tends to facilitate the comprehension of child development, especially with regard to the complexity of ASD signs and symptoms.

The manner of approaching such concepts in training programs is as important as the concepts themselves. Developing a methodology for producing teaching material for use in this con-

text, by way of employing images that illustrate children's behavior, considerably facilitates the acquisition of knowledge. This and other effectiveness criteria (especially knowledge transfer) are recommended measures for validating programs focused on the early identification of ASD in primary care.

The implementation of programs of this nature in Brazil involves numerous challenges, including the following: the development of strategies for forming the teams; the work hours allocated to the program; the practical advantages of obligatory participation versus the ethical and motivational issues implicit in such a solution; the differences between members of the same group (amount of experience, schooling, occupation, training, etc.) and their impact on learning; and the increased cost of the program when one adopts higher levels of evaluation of effectiveness (e.g., the on-the-job context). Conducting and disseminating studies of this nature can contribute to the adoption of strategies that facilitate solving problems that arise.

Each stage of the development, implementation and assessment of evidence-based programs of continuing professional education in the area of ASD involves challenging tasks. Nevertheless, the primary care actions presented in the present study potentially promote health since they are centered on child development.

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