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Imitation as an Element of Social Interaction of Children with Down Syndrome at School

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1. Introduction

Because of the development of new health practices, mainly those related to prevention and early diagnosis, life expectancy of people with Down Syndrome (DS) in developed countries increased from 12 years in 1940 (Penrose, 1949) to 60 years nowadays (Bittles, 2004; Glasson, 2002). Different kinds of treatment and therapies, especially early stimulation, have contributed to the development and social performance of persons with DS (Moreira, 2000), so that she/he can experience new situations such as inclusion in regular schools.

Diagnosing trisomy is not significant in the prognosis or determines strong more or less pronounced physical aspects. It does not establish higher or lower intellectual effectiveness, either. There is a consensus in the scientific community that there are no different levels of DS and that the developmental differences occur because of individual characteristics that stem from genetic inheritance, stimulation, education, environment, and clinical problems, which are all inter-related (Silva & Kleinhans, 2006).

Children with DS can have difficulties adapting socially because of the delay in mental and motor development. Thus, family support and motivation are needed to help the development of stronger autonomy when performing daily life activities (Glat, 1995). Because the family can help those children to, or prevent them from integrating in life contexts, it is extremely important to educate and advise the family from diagnosis on in order to make them aware that the child will go through all stages inherent to development, which imply different needs, including professional help involving objectives and strategies that will consider not only the level of impairments, motor and language changes but also the child's potential and skills to perform daily tasks and live in different community settings (Glat, 1995).

Although children with DS present lower functional performance when compared to children with typical development, that difference does not remain consistent throughout their development because the child with DS, little by little, develops mobility skills that are gradually incorporated to his/her daily repertoire, affecting his/her independent performance in several daily activities (Mancini et al., 2003).

In DS, sequential auditory memory problems somehow block attention and make it difficult to stay focused as long as necessary, which shows those subjects' difficulty storing sequential information. Physical tiredness itself and brain synaptic communication prevents information from flowing properly, which is understood as lack or loss of attention

(Troncoso & Cerro, 1999). That shows the importance of imitation and the presence of a role model for an individual with DS, when his/her attention fails, as pointed out by the authors, he/she can, by imitating the model, find ways of regaining the content missed because of the lack of attention.

2. The role of school in social interaction

Throughout the history involving disabled people there has been a world wide concern regarding their integration into society and, as with any ordinary citizen, their civic life starts in school, thus, it is only fair that those people be included in these socio-educational settings.

School is a very rich environment for the development of social skills, and it is noticeable that children from well-structured school settings tend to be more sociable, show more developed social interaction, play more advanced games with their peers, and exhibit more solid knowledge of social rules (Bonome-Pontoglio & Marturano, 2010).

The objective of child education is to make the child develop a positive image of him/herself, be more and more independent, trust his/her abilities and perceive his/her limitations; to find out and know his/her body little by little, his/her potentials and limitations by taking care of his/her health and well-being; to establish affective and exchanging bonds with adults and other children, strengthen self-esteem and expand possibilities of communication and social interaction gradually; to establish and expand social relations by learning how to articulate his/her interests and points of view, respect differences and develop aid and cooperation actions; to observe and explore the environment out of curiosity and feel as part of it, as an agent that will be dependent on and transform the environment, valuing attitudes which contribute to its preservation; play, express emotions, feelings, thoughts, desires and needs; use different languages (body, musical, artistic, verbal and written languages) for different intentions and communication situations, in a way to understand and be understood, express ideas, feelings, needs, desires and progress in the process of meaning construction, enriching his/her expression skills; learn about some cultural manifestations, showing interest, respect and participation and value diversity (Brazil, 1998).

Entering school is the child's first contact with the world outside the family environment. It is a big step as well as a challenge to those who participate in that new stage. To understand child development it is necessary to observe him/her not only as an individual but also in his/her social relations. It is important to observe the way the child expresses him/herself in a group in order to understand him/her. The school can help the development of his/her individual identity and favor his/her future social relationships in a determinant way through relationships with the others.

A disabled child's inclusion in regular schools is getting more and more common and the way it happens is closely related to local culture and policies (Luiz, 2009), that is the reason why it may happen in many different ways in cities, regions and countries (Buckley & Bird, 1998).

Inclusion foresees school integration in a radical, complete and systematic way in which all students should be in regular school classrooms. There is a proposal of a way of organizing the educational system which considers the need of all students and it is designed according to those needs in inclusive schools. Therefore, it involves not only the disabled students but also all those who have any kind of learning difficulties. The inclusive view eliminates the

subdivision of special and regular school systems. According to that view, the school should address differences without discriminating, without working separately with some students and without establishing specific rules to plan, learn and evaluate. For the proponents of school inclusion it is mandatory that the educational establishments eliminate architectural barriers and employ teaching practices appropriate to the students' differences in general, providing alternatives which contemplates diversity besides the teaching resources and special equipment that can meet all educational needs of the students with deficiencies or not but without discriminations (Mantoan, 2003).

According to Buchley and Bird (1998), there is evidence that inclusive schools have been seen as the best schools for all kinds of children, and those that are prepared to receive children with special needs and have changed the teaching system, have improved education for all children. In such inclusion process not only the children with special needs experience positive aspects, but also all children who start living with diversity become more prepared as human beings for adversities and differences in life. In this case, the society will be responsible for the inclusion of all people who present some kind of difference, in other words, the society must adapt, accept and live together with all its elements, regardless of their abilities or their difficulties.

According to Vieira and Denari (2005), for school inclusion to take place, besides school structural, ideological and professional transformations, it is essential to consider the social and objective aspects of the process. Misinformation and lack of daily contact among people with typical development and people with special educational needs, can contribute to the build up of prejudice and difficulties in social interactions. That is the reason why it is necessary to boost direct contact and access to information and encourage thinking about diversity from an early childhood.

The objective of pre-school is to facilitate learning of basic concepts, provide socialization and development of skills of autonomy in self-care activities. Thus, when parents and teachers include a DS child in pre-school, they expect that they can, mainly, develop their comprehension of rules for social living, acquire autonomy to perform self-care activities such as eating and hygiene (Ferraz, Araujo & Carreiro, 2010) and become literate (Rubim, 2009).

Although DS children exhibit lower social interaction than their peers with typical development, when they are included in pre-school, they accelerate their language development, decrease their aggressive behavior and learn social rules (Monteiro, 1997).

Nowadays it is widely accepted that neurobiological functioning and environmental experience are reciprocally influenced (Cichetti & Toth, 2009) and advances in neuroscience have contributed to the understanding of a young child's development in his/her interaction with the environment (Bonome-Pontoglio & Marturano, 2010).

Living together in an environment which promotes a variety of stimuli and different possibilities of discoveries will allow the individuals' brain reorganization and plasticity (Silva & Kleinhans, 2006). It is undeniable that adults strongly influence a child's life in relation to cognitive and social development, however, children can also learn from their peers (Flynn & Whiten, 2010). Thus, schools become a very important place for learning.

Social interaction is one of the most important tasks of a child's initial development because it is characterized by the expansion and improvement of one's social behaviors repertoire and, simultaneously, by a gradual understanding of values and rules which govern life in society (Del Prette & Del Prette, 2005).

Studies have shown that the inclusion of disabled children is beneficial and promotes gains not only in terms of academic achievement but also in terms of skills related to speech and social behavior (Buckley & Bird, 1998; Buckey, Bird, Sacks & Archer, 2006).

By making an association between the process of social interaction and school inclusion of DS children it is possible to consider that when they enter school, interpersonal relationship with their school mates offers wider range of role models and demands for the acquisition of new social skills. Social performance and quality of relationships at school are based on behavioral resources previously acquired by the children in their family environment. Considering recent inclusion policies, it is possible to understand that interpersonal development (especially problem solving skills, self-control and pro-social behavior) is an essential component of that process. Such stance is consistent with those adopted by several researchers who promote the improvement of relationships among peers as one of the main objectives of inclusion: motivation of acts of comprehension and understanding of differences on the part of peers and teachers (Del Prette; Del Prette, 2005).

Several authors mention that children with regular development prefer to imitate adult behavior in order to meet a specific goal (Huang, Heyes & Charman, 2006; McGuigan, Whiten, Flynn & Horner, 2007; Whiten, Flynn, Brown & Lee, 2006). Children do that because they want to get socially involved and show that they are similar to the others around them (Nielson, 2006; Nielsen & Carpenter, 2008).

Imitation, as any other cognitive processes, is not innate, it changes due to the subjects' actions on the objects in the environment, firstly it is an extension of the action, that is, movements where the child can see her/himself doing the action and it evolves to a moment when the action becomes internalized and the child acquires the possibility of imitating events even in the absence of role models (Piaget, 1964/1978).

In child development, imitation presents two different but complementary functions, one of them is the cognitive function that makes learning about world events possible, and the other is an interpersonal one, which allows sharing experiences with the others (Uzgiris, 1981). Imitation occurs primarily because the child needs to understand the others' intention in communicating, that is, he/she is going to imitate whatever she/he thinks that his/her peer wants to be imitated, thus "feeding" social interaction (Nielsen & Hudry, 2010). As can be seen, imitation is a very important characteristic of the construction of social skills.

There has been increasing evidence that children with DS are strongly likely to copy the others (Wright, Lewis & Collis, 2006; Anhão et al., 2010). Children with DS are very observant and they use imitation as an instrument for creating social skills.

In an observational, non experimental study conducted by Anhão et al. (2010) with three to six-year-old children with DS from the regular educational system, it was possible to observe that, among several observed characteristics of social interaction, when compared to their peers with regular development, only two kinds of skills presented statistically significant results: "makes first contact" and "imitates (an) other child/children".

3. Contacting others

The typical development group had higher number of "makes first contact" behaviors. Such behavior indicator tried to investigate how often the study subjects (with Down Syndrome and regular development) started social interaction, that is whether she/he tried to make contact with another child, suggested games, started a dialogue with another child, or invited a peer to play by touching (Anhão, 2009).

Those results suggest that children with typical development, the study subjects, found it easier to start social contact. Angélico (2004) classified that kind of behavior as social communication skills in his study about the social repertoire of teenagers with DS. The same

author verified that in the situations studied most of the subjects with DS had a deficit of responses for assertive coping in their behavioral repertoire.

According to Soresi and Nota (2000), many studies have shown that people with mental retardation have poor interaction with the others. The same authors, through a meta-analysis of different studies, claimed that DS school children and those with developmental disorders (moderate or severe) poorly adapt to school demands and, in general, experience difficulties achieving reasonable levels of school performance. They especially have difficulties in two wide classes of behaviors which are fundamental for school adaptation: relationship with peers and relationship with teachers. The latter is related to the ability of meeting the teachers' requests within school settings and the former is related to the ability of participating in group dynamics, facing negotiation skills and start positive relationships with schoolmates. Those difficulties decrease the quality and number of social experiences, which potentially results in serious negative effects on their abilities to adapt to adult life and on their social integration. That ability must be stimulated by the school environment for a complete development of life aspects, both in DS children and in children with typical development. Thus, inclusion is founded on the human and socio-cultural dimension which tries to enhance forms of positive interaction, possibilities and support for difficulties, and meeting needs, all of which is done by listening to students, parents, and school community. Among other aspects, children with DS have been shown to present a deficit in social assertive abilities, those that depend on a stronger initiative and to develop better passive social skills, meaning those in which the influence of the environment is determinant (Anhão et al., 2010).

The set of abilities that allows children to understand, make references and consider their own and the others' state of mind and compare them, participating socially based on that comprehension is known as the theory of mind (Alves et al., 2007). The theory of mind is an area that investigates pre-school children's ability to understand their own and the others' state of mind and, thus, predicts their actions or behavior (Astington & Gopnik, 1988, 1991; Dias, 1993; Feldman, 1992; Lourenço, 1992; Siegel & Beattie, 1991; Wellman, 1991). Research on the theory of mind by Baron-Cohen and colleagues (Baron-Cohen, 1991 and Baron-Cohen, Leslie & Frith, 1985) with autistic and DS children were very important for the development of the innatist perspective. Leslie (1987) argues that the sheer absence of ability for popular psychology in autistic and DS children would support the opinion that those children have an innate neurological deficit.

A child, from a very early age, has the ability to regulate shared attention (Baron-Cohen, 1991). According to Fodor (1992) human beings are born with a social module which allows them to acquire the popular psychology typical of the culture they belong to. To that author, the theory of mind is related to the innate capacity of elaborating theories, that capacity would involve an intellectual process aiming to infer a group of beliefs guided by certain rules, which is another group of beliefs.

4. Imitating the others

Anhão et al. (2010) found out that a group of DS children presented greater "imitates (an) other child/children" behavior in comparison with their peers with typical development. That social ability referred to moments when the child observed his/her peers performing some kind of action (during a pedagogical activity or a game) and reproduced it in his/her own way. "Imitates the teacher" behavior, which referred to moments when the child (with

DS and with typical development) observed the teacher's action, his/her way to gesture or speak, and reproduced it in his/her own way, did not show significant differences in frequency between DS children and those with typical development (Anhão et al., 2010).

These data may suggest that DS children are more likely to imitate other children's behavior, and not to seek a performance "model" among teachers. Comparing the latter observed in this study it was possible to notice that this difference does not mean that the teacher does not have an important role in the process of social interaction and inclusion, but rather that children in that age require more interaction with others who have the same interests as their own, thus they imitate their peers. Such results show the importance of school settings in inclusion as a positive aspect in the process of social and academic development since that setting influences a stronger contact with DS children as well as with other children with typical development in the same age, which does not happen in protected settings of special learning or even in therapeutical settings. School inclusion has proved to be really effective providing models of social performances which are effective for DS children, helping them to create social symbols which are determinant for the development of social aspects (Anhão et al., 2010).

Rosin-Pinola (2006) believes that interpersonal development of students with some disabilities can be seen as an adjuvant in the process of integration and inclusion of those in regular school, as it increases the number of demands for communication with peers and a better use of social conditions of development and learning.

Social skills are learned and the demands for their performance vary according to the stage in which the subject is as a result of environmental contingencies to which he/she is exposed to (Angélico, 2004). Thus, a pre-school child does not have the same social abilities as one from elementary school, and the abilities of a teenager would exhibit are not the same as the ones expected in an adult or an elderly (Soresi & Nota, 2000).

The results by Anhão et al. (2010) show the importance of providing children with special educational needs with an inclusive education system as soon as possible, as Stainback and Stainback (1999) have noted.

As mentioned before, imitation of others is widely recognized as a fundamental behavior for the learning process in the first years of life because it supports the development of relationships others and it is the basis of social learning (Hurley & Chater, 2005). Although children with DS are considered good imitators, the study by Vanyuchelen, Feys and De Weerdt (2011) pointed that that behavior seems be more associated to age than to some specificity of the syndrome.

As several important authors talk about imitation in children with regular development, it makes sense to bring such observations to the world of children with DS.

Therefore, it is necessary to understand how DS children's behavior occurs in the school setting as opposed to imitation actions in their peers with typical development, which contributes to their social interaction and learning. Thus, it is important to understand how imitation happens according to different authors.

5. Imitative action

Wallon (1979) presents the situation by focusing on two different ways of determining imitation. The first one says that imitation is an action which reproduces a model, but that implies admitting acting previous to it. He believes that imitation stems from postural activity and distinguishes spontaneous imitation from intelligent imitation. The role model

does not impose him/herself as something external to the subject and although it has originated as a perception it seems to be intimate and impels him/her to an imitative action which complements and reestablishes a psychomotor agreement. The second one, imitation is different from the model: the subject decides to imitate or not something felt as external. The change from one to another is, however, a slow and complex process. Intelligent imitation tends to establish dissociation between what is noticed, desired or imagined and what is done. That opposition provides an acting plane. Acting would be, according to him, the result of the replication of reality, in other words, a development from the sensitive, concrete plane into a similar one, formed by images, symbols and ideas.

The similarity between imitation and acting leads us to think about the influence or participation of imitation during acting too. It is clear that both processes develop to different planes: one in the motor plane and the other in the plane images and symbols. But the strength of the analogy is due to the fact that both processes have a problem in common: turning an intimate formula, a result of a condensation of impressions and several experiences, into successive terms, that must be localized in time (Pedrosa, 1994).

Studies by Nadel (1986) and Nadei and Baudonnière (1981) show some kinds of imitative behavior among children, and they state that the main basis of social relationships among three-year-old children is an immediate imitation. Eckerman, Davis and Didow (1989) showed that in children who are around 2 years old, interacting with peers who are not familiar, a new behavioral organization appears: the child repeatedly imitates the others' games creating social games which seem to be constructions of the moment and not a reestablishment of the script previously rehearsed with familiar peers.

Eckerman and Stein (1990) compared 24-month-old children interacting in dyads with and adult during a game. For eight children, the adult reacted as if following a program, imitating the child's movements during the game, for the other eight, the adult reacted to the same game material but in a different way, not related to the child's actions, this procedure is similar to the way the partner of a child reacts when they are below 24 months old, according to some previous observations. The authors mentioned above assumed that imitative actions, which occurs more often at around 24 months is one of the elements which contribute to a new form of behavioral organization identified in peer children of that age: imitation motivates imitation and leads to the generation of social games in dyads. The results of the experiment described, conducted with child-adult dyads, point to the authors' assumption and they emphasize the need of continuing with the studies with children interacting in natural situations.

Nadei et al. (1989) believe that imitation among young children, who still do not command a verbal linguistic code, makes up a transitory system of socially sustained exchange and has a fundamental role in communication among peers.

According to Winnicott (1996), cognitive, social and intellectual development depends mainly on the relationship of the child and the transition object, which is the peak of a good individual development and the game of imitating relatives, teachers and friends start from that. Therefore, imitation games contribute to growth and health and lead to group relationships.

Imitation is based on the perception-action mechanism which combines the visual kinematic characteristics of an action perceived with the motor kinematic characteristics of the action itself (Prinz, 2002). That visual-motor skill starts much earlier than the development of language for the children, which is very clear in children with typical development soon after the birth (Meltzoff & Moore, 1977) as well as in DS children (Heimann, Ullstadius & Swerlander, 1998; Heimann & Illstadius, 1999).

When a child imitates another person there is a discharge on the mirror neurons (Gallese, 2007). Those neurons are brain cells which fire when a subject copies an action or simply observes someone performing some actions (Rizzolatti, 2006). The activation of these neurons helps children to understand other actions and, therefore, they play an important role in learning, how children learn about the world, how they act and how they play (Stagnitti, 2009).

6. Imitation in school routine

In school routine imitation is many times understood negatively because it limits creativity and neutralizes students' free expression, as in the sentence "he who copies, does not create", and in the discussion about the relation between copy and re-reading of works of art. Thus, imitation is doing the same as somebody else in a mechanic way and does not represent the subject's cognitive potential (Pimentel, 2000). Here, however, imitation is being considered not as a copy but as a reproduction of an action after an observation the way that the observer understood and learned the mentioned action, in an attempt to feed social interaction.

According to Fernandes (2005), it is through imitation that children in general recreate and not just make a copy of the world they live in. He also states that imitation is inherent to the learning process, changing according to historical and cultural determinations, not in a mythical or mechanics way, but as a determinant factor for acquisition of knowledge and future development of the students. Imitation is an intellectual activity when the individual acts under others' influence, however, he/she grasps knowledge according to his/her development level.

Teaching imitation skills is, many times, the first step of interventions with children with intellectual disabilities (Vanyuchelen & Vochten, 2011), DS children can be included here.

In psychological studies, imitation is studied through different theories. According to the genetic theory, imitation follows the level of development, forming structures of inner symbolic representation that evidence intelligence and is a copy of images which have been interiorized (Piaget, 1978).

In the behaviorist conception, imitation is the objective and mechanic copy of what is around and it is able to modify an individual's behavior and make up his/her own habits. Thus, the child learns by modeling and observing (France, 2998).

Vygotski states that imitation is a dynamic process which contributes to learning and makes it easier, demystifying the mechanic or restricted aspect attributed to it (Gasparin, 2002). Vygotski, however, does not rule out the possibility that there are times when imitation becomes simply mechanic. However, he tries to expand that restricted sense to a wider one in which imitation is the basis on which acquisition of human knowledge and development occurs. That premise counts if imitation is observed as an intentional and intellectual human activity. Thus, a dialectical unit is formed between mechanical imitation and intellectual one (Fernandes, 2005).

Vygotski (2001), in a social historical view, believes that a proximal development zone is more important for intellectual development and improvement than the actual level of development because it confirms the thesis that a child who is helped can do more than when he/she does that alone. He adds that it is only possible to imitate what is in the area of intellectual potential, in other words, to imitate it is necessary to have some possibilities to go beyond what is already known. Development derived from collaboration via imitation is

the capacity to transform what children can already do into what he/she still cannot do, providing a basis for learning and subsequent development.

When it is said that a child imitates, it does not mean that she/he looks at another person and imitates him/her like a mirror, it indicates that a future action can present characteristics of the way the other does things. Such aspect is subjectively implied in daily relationships in a classroom. Thus, learning through imitation means that the child performs better when he/she learns together with other people (Fernandes, 2005).

7. DS children imitation in school routine

Fernandes (2005) points that when the human being imitates, he/she does it according to cultural references that he/she has as basis and establishes new associations and combinations according to his/her interests and needs. The individual never simply copies the other, he/she makes a connection between imitation and creation.

Memory has an important role in the development of the human being's intelligence and learning. Children with DS hardly ever forget what they learn well. Those children's visual memory develops faster than the auditory one because of the bigger amount of stimuli, thus, they acquire good sensory memory, recognizing and searching for stimuli. Progressive learning facilitates the development of the sequential auditory, visual, tactile and kinesthetic memory (Escamilla, 1998). Once again the hypothesis that imitating a model could help individuals with DS develop better memory aspects comes up.

Troncoso and Florez (1997) believe that DS individuals do not have difficulties performing old activities using common knowledge even if they are long, but they have problems when it is necessary to develop new conducts which request programmed organization, in other words, a new sequence of actions.

Learning requires responses which can be motor, verbal or graphic. A DS child's response is poor because of the limitations that they can possibly have. However, the possibility of expanding and determining certain responses will depend on environmental support. The more a demanding environment is offered, one that promotes autonomy and offers different possibilities of discoveries of their potential, the better DS child's development will be. By recognizing the characteristics of the phenotype of people with DS, it is better to focus on proposed activities in areas of greater potential to be developed. Thus, an individual who notices that he/she can perform such tasks successfully will be more satisfied and motivated to face more challenging tasks. Education needs patience, dedication and consistency, and above all, professionals' and parents' love and affection. Everyone has abilities and difficulties, it is necessary to know them and learn how to deal with them (Silva & Kleinhaus, 2006).

Ciciliato et al. (2010) compared a group of children with DS and a group of children with typical development, 12 to 36 months old, to characterize the development of symbolic abilities present in those two groups. Among the results, it was possible to confirm the hypothesis of the delay in symbolic abilities for the group of DS children. But sonic and gestural imitation was not statistically different between the two groups. Children with DS in this study explored objects repeatedly through few actions and, using sensory motor activities with no organization of objects and imitating words and visible gestures of their own.

Making first contact as proposed by children with regular development shows that they are open to new experiences and interactions in general, they try to make social contact by

themselves. Imitating their classmates for DS children shows that they look for new ways of acting and performing in their settings. DS children have a deficit of assertive social abilities, in other words, of those that depend on a stronger initiative and develop better passive social abilities, meaning those where the role of the environment is determinant (Anhão, 2009).

8. Final considerations

The development of social interaction of DS children occurs in fairly similar ways to that of their peers with typical development, differing only in rhythm and in the way DS children try to sustain that relationship. Thus, it is important that some practical educational changes are made in order to achieve real inclusion of those students in regular educational setting, turning them into actions that will be beneficial for the maturity and growth of children with typical and non typical development.

Establishing contact with the other and imitating another child's behavior are important aspects for the development and establishment of abilities and social interactions, so, it is important to mention school environment as a facilitator that will promote a stronger contact of DS child with other children in the same age group, helping the development of social abilities of those children.

Therefore, it is possible to highlight the importance of the inclusion of DS children in the regular educational system, favoring living with educators and peers, helping their acquisition of social abilities and necessary behaviors in society.

This way, it is possible to see that the results show the importance of providing children with special educational needs with an inclusive educational system as early as possible as Stainback and Stainback (1999) have noted. All children with any kind of difficulty, regardless of physical, cognitive or emotional conditions, are children who have the same basic needs of affection, attention and protection, and the same desires and feelings as any other children. They are able to live together, interact, exchange, learn, play and be happy, although, sometimes in a different way. That different way of being and acting is what makes them unique and special. They must be seen not as a failure, but as people with different potential, with some difficulties that, many times become challenges from which we can learn and grow, as people and professionals who try to help their neighbor. With inclusion, we can make students with special educational needs be exposed to positive forms of communication and interaction, of assistance and of different social exchanges, to challenging learning conditions where they are required to think, solve problems, express feelings, desires and take initiatives.

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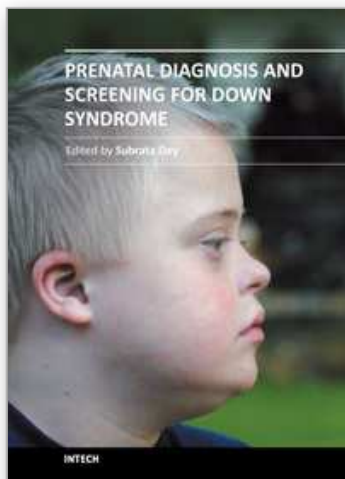
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This book provides a concise yet comprehensive source of current information on Down syndrome. Research workers, scientists, medical graduates and paediatricians will find it an excellent source for reference and review. This book focuses on exciting areas of research on prenatal diagnosis - Down syndrome screening after assisted reproduction techniques, noninvasive techniques, genetic counselling and ethical issues. Whilst aimed primarily at research worker on Down syndrome, we hope that the appeal of this book will extend beyond the narrow confines of academic interest and be of interest to a wider audience, especially parents and relatives of Down syndrome patients.

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