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## **ABA for older children – Supporting evidence**

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Applied Behaviour Analysis (ABA) is the applied branch of the science called Behaviour Analysis. The term 'Applied' refers to the application of the findings of the scientific study of behaviour to socially relevant targets. ABA has proven effective with different populations and in different areas, such as in treating individuals with autism and adults with aphasia, in the area of business organization, in designing effective interventions for children with learning disabilities, in treating phobias, etc.

One of the principal areas where ABA has demonstrated its effectiveness is in teaching skills to and treating behavioural problems of children with autism. There is an extensive scientific literature based on research conducted during the last 40 years approximately, which supports ABA as the ideal intervention for individuals with autism (e.g., Kuppens & Onghena, 2011; Eldevik, Hastings, Hughes, Jahr, Eikeseth, &

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Cross, 2009; McEachin, Smith, & Lovaas, 1993; Reichow & Wolery, 2009), demonstrates its superiority over eclectic treatments (Dillenburger, 2011a; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Osborne & Reed, 2008; Zachor, Ben-Itchak, Rabinovich, & Lahat, 2007) and shows that parental stress declines after the intervention (Dillenburger, Keenan, Gallagher, & McElhinney, 2004). Most of this research is conducted with pre-school and school-age children but in the last years there is a growing number of studies focusing on treatment of adolescents, youths and adults with autism which are equally interesting for proving that ABA can be effective independently of the individual's age.

One misconception that has up to date guided government policies related to funding but fortunately not clinical practice and scientific research is that ABA is effective only with children of pre-school age. There is now enough supporting evidence suggesting that if an intervention based on ABA starts before the age of 4 years, the outcomes are higher than starting later. This conclusion has led to the false belief that ABA is not effective in children of school age, adolescents, youths and adults. There is no scientific evidence up to date including that intervention should be stopped at a specific age due to its lack of

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effectivity, instead there is growing research evidence for the opposite conclusion, positive and valuable gains. For example, McEachin, Smith and Lovaas (1993) indicate that it took six years for one of the best-outcome children to reach typical functioning.

The misconception that ABA is not effective after the age of 7 can be very prejudicial to thousands of children, adolescents, youths and adults, as decisions related to their treatment directly influence their quality of life and the quality of life of their broader social network. Limiting a beneficial intervention due to a misconception that is not evidence-based would lead to a child acquiring fewer skills than possible, maintaining non-desired and non-adaptive behaviours in his repertoire due to the lack of specialized treatment, showing decreased independent skills, reducing his possibilities of integration, etc.

Given the above, there is a clear need for conducting more research studies showing how methods based on the science of ABA can be effective with older children, adolescents, youths and adults. In the following paragraphs, we will do a very brief revision of the existing body of literature supporting the effectiveness of ABA with children older than 7



years old, adolescents, youths and adults. Also, we will provide some data on brain development as it has been described in studies that use neuro-imaging, in order to give a clear picture of the learning possibilities of an individual independently of his age.

Several review articles and meta-analyses have been published summarizing the large body of literature (thousands of studies) supporting ABA-based intervention as the most effective one for individuals with autism (e.g., Eikeseth, 2009; Howard, Sparkman, Choen, Green, & Stanislaw, 2005; Koegel, Koegel, Harrower, & Carter, 1999; Krantz & McClannahan, 1993; Lovaas, 1987). These studies describe effective procedures developed across a wide range of skills and problem behaviours, such as language and communication (e.g., Carr & Durand, 1985; Durand, & Carr, 1992; Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998), daily living skills (e.g., Horner & Keilitz, 1975), academic skills and school integration (e.g., Koegel, Koegel, Hurley, & Frea, 1992; Daly & Martens, 1994; McComas, Wacker, & Cooper, 1996), reduction of stereotypical behaviour (e.g., Dounavi, 2011) and other. In these studies, participants are individuals with autism of all ages, from pre-school children to adults, so demonstrating the effectiveness of the ABA-based



procedures independently of the individual's age. One of the most interesting studies offering support to ABA-based intervention at a later age, is the one conducted by Harris and Handleman (2000) in which the authors clearly state that great benefits were observed following ABA intervention with older children as well. Additionally, there is a large number of small sample sized studies, which have demonstrated the effectiveness of ABA to teach specific skills in different areas and reduce problem behaviours of various types to adolescents, youths and adults with autism. Here, we will only mention some of them. Haring, Roger, Lee, Breen and Gaylord-Ross (1992) demonstrated the effectiveness of a social network intervention for youths with moderate and severe disabilities, including autism, by measuring the frequency, number and appropriateness of social interactions using a multiple baseline design and showed that the intervention was successful in increasing the quantity and quality of interactions and promoting friendships. Other studies have also demonstrated effective ABA-based procedures for youth population (e.g., Haring, Roger, Lee, Breen, & Gaylord-Ross, 1984; McMorrow & Foxx, 1986; Gena, Krantz, McClannahan, & Poulson, 1996; McGee, Krantz, Mason, & McClannahan, 1983).



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School age children between the age of 7 and before the start of adolescence have also been significant in proving the importance of following an evidence-based intervention, ABA. For example, Taylor & Levin (1998) demonstrated the effectiveness of a prompting technique for a 9-year-old student with autism to make verbal initiations about his play activities. Blew, Schwartz and Luce (1985) described how older children with autism were taught community skills, such as crossing the street, making purchases, and checking out books from the library, and other. During these years, most of the children that have already followed an ABA-based intervention during preschool age are now in need of an ABA-intervention that will guide their integration in mainstream schools, design effective individualized educational programmes for social interactions with peers and teach academic skills in an effective way. Frequently, adolescents are in need of similar support provided through ABA-based services. There are plenty of examples of research studies that focus on the acquisition of these skills, such as how to train shadow teachers to support the integration of children with autism in the mainstream classroom (Monahan & Bryer, 2004).



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Studies focusing on adolescents have been numerous and have demonstrated significant effects of ABA-based interventions to improve skills acquisition and reduction of problem behaviour (e.g., Miller & Neuringer, 2000). For example, Delano (2007) showed how to improve language performance of adolescents with Asperger Syndrome and Palmen, Didden and Arts (2008) showed how to improve question asking in high-functioning adolescents with autism.

The research about adults is also extensive and focuses on different areas, such as sign language (Schepis, Reid, Fitzgerald, Faw, VanDenPol, & Welty, 1982) independent life skills [Haring, Kennedy, Adams, & Pitts-Conway, 1987], job skills for laboural integration [Smith & Coleman, 1986], reduction of aggressive behaviour (Hagopian & Adelinis, 2001; Thompson & Iwata, 2001; Lalli, Mace, Wohn, & Livezey, 1995) and other.

Regarding brain development, one of the arguments often used to support the non-evidence based view that funding should be stopped at a certain age is that after early childhood the human brain is not flexible and, therefore, further development is negligible. Here, we briefly summarize the scientific conclusions that broadly show that ABA-based intervention brings very significant gains to individuals with autism of all

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ages. Recent research using advanced imaging technologies is consistently showing that brain development continues well at least into adolescence and early adulthood (e.g., Horska, Kaufmann, Brant, Naidu, Harris, Barker, 2002). Namely, Thompson, Giedd, Woods, MacDonald, Evans and Toga (2000) reported the creation of networks of growth patterns in the developing human brain in children aged 3-15 years, which seems to decline only after puberty. Sowell, Thompson, Tessner and Toga (2001) mapped continued post adolescent brain growth. Keshavan, Diwadkar, DeBellis, Dick, Kotwal, Rosenberg, Sweeney, Minshew and Pettegrew (2002) assessed age-related changes in the size and signal intensity of the corpus callosum of individuals aged 7-32 years and found that signal intensity decreased during childhood and adolescence and stabilized in young adulthood and that the size of the corpus callosum increases through young adulthood indicating continuing maturation.

Based on the above mentioned empirical evidence, many scientific, government and professional agencies and organizations have concluded that ABA-based procedures represent best practices for individuals with autism, are highly recommended and should be publicly funded. Examples of such agencies and organizations in the United States and other

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countries (e.g. Canada, Australia, the UK, etc.) are the National Institute of Mental Health, the National Academies Press, the Association for Science in Autism Treatment, Autism Speaks, the Organization For Autism Research, the Surgeon General of the United States, the New York State Department of Health and other (Dillenburger, in press).

Taking into consideration the medium and long-term benefits for a community from the development of an individual's skills and analyzing the cost benefits for tax-payers, local authorities, states and countries by effective interventions (Knapp, Romeo, & Beecham, 2009; Motiwala, Gupta, Lilly, Ungar, & Coyte, 2006), any decision regarding funding interventions should be data-driven, should take into account ethical considerations and should guarantee that the best known scientific practice up to date is delivered to individuals needing it. An example of a cost-benefit analysis is the fact that in the USA savings of approximately \$200,000 per child by the age of 22 years and \$1,000,000 by the age of 55 years were registered following behaviour analytic intervention (Dillenburger, in press).



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