

LONGITUDINAL STUDIES OF IQ STABILITY IN CHILDREN WITH CHILDHOOD AUTISM – LITERATURE SURVEY

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SUMMARY

Background: In this paper we present a survey of the literature dealing with IQ stability in children with childhood autism (CA) over the last ten years. Nowadays there is no clear evidence on this topic.

Subjects and methods: We used the online "PubMed" database. By inputting the following key words: (autism and IQ and child) and (stability or outcome or follow-up) we obtained a total of 78 references. Out of those 78 references, some papers were left out in line with the exclusion criteria, so this survey includes 23 papers altogether.

Results: The average initial IQ point is in the range from borderline intelligence to mild mental retardation. Out of a total of 23 studies, the majority, 19 of them, generally state that there are no changes in IQ, 8 studies mention increased IQ, while 3 studies demonstrate a decrease in IQ. Some studies register different results in the same study. At an individual level, single studies show a similar trend to the general results.

Conclusion: The majority of studies state that the IQ points will remain the same. Today the generally accepted belief is that therapy should be started intensely and early. Some children with good progress may attend regular school.

Key words: autism - mental retardation – intelligence – IQ – child – stability – outcome - follow-up

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INTRODUCTION

According to the international disease classification ICD-10 Pervasive developmental disorder (PDD) includes the following: childhood autism (CA), atypical autism, Rett's syndrome, other childhood disintegrative disorders, overactive disorder associated with mental retardation and stereotyped movements, Asperger's syndrome, other PDD and PDD unspecified (World Health Organization 1999). The American classification within the Pervasive developmental disorders group defines the following: Autistic disorder, Rett's disorder, Childhood disintegrative disorder, Asperger's disorder and PDD not otherwise specified (American psychiatric association 1994). This work will focus on the specific category of CA ie. of Autistic disorder.

The data suggests that early detection and early intervention in CA is related to better outcome (Volkmar & Pauls 2003). Often therapy will be applied even before establishing the final

diagnosis of CA (Filipek et al. 2000). The parents' concern that something is wrong with the child should be taken into account. Assessment should occur by the time the child is one or two years old. The parents expect from the experts clear and defined answers regarding diagnostics and possible therapy of the child's disturbances. Diagnostics such as screening questionnaires should be applied as early as possible. Especially important is the role of the primary contact physician (pediatrician, general practitioner, family doctor) (Filipek et al. 2000, Volkmar et al. 1999).

Social problems are some of the most prominent features in CA (Volkmar & Pauls 2003). Communication problems are frequent. Almost three quarters of children with autism have a comorbid mental retardation (MR) (Volkmar & Pauls 2003). An IQ profile where the verbal IQ is lower than the nonverbal IQ profile has been traditionally found in children with CA, and can be evaluated as a diagnostic sign (Lincoln et al. 1995), but this discrepancy can be lost in time (Joseph et

al. 2002.). Isles of preserved capacities can be present, individuals may have musical potentials, great abilities like reckoning calendar days or calculating, etc., as well as specific ways of behavior (Volkmar & Pauls 2003).

Recently there are many studies that have longitudinally followed-up children with CA, and almost all of them have applied a particular therapy. One of the most cited intervention studies is that by Lovaas (1987), who in his work adduces "spectacular" effects of intervention (measured by decrease in autistic symptoms and increase in IQ points). However, these findings could not be completely confirmed later on. Although the result of this study was promising and the study was performed in the late eighties, looking back through the last ten years, CA suggested that this diagnosis had a less favorable prognosis in general, i.e. the majority of persons with CA showed deviations lasting their whole life (Nordin & Gillbert 1998). Thus, two thirds of persons with CA throughout life remain very socially damaged and incapable of achieving minimal basic personal needs. Intellectual level and communication abilities are considered to be the most important predictors for adult outcome of CA. (Volkmar & Pauls 2003).

From our own clinical experience, in which we participate in the diagnostics, therapy and follow-up of children with CA for many years, we could perceive some children stagnating with time, that is: not progressing, while in very rare cases positive total improvement could be observed (by decrease in autistic symptoms, improved communication and raise in IQ points). With regard to monitored variables, it is customary to follow the symptoms of autism, parallel with IQ scores, having in mind the high comorbidity of autistic symptoms and MR. Studies which have been performed so far show data on stability of autistic symptoms (e.g. Jónsdóttir et al. 2007), which means that in a lesser degree diagnosis from the spectrum of autistic disorders will be lost. However, the stability of IQ in children with CA is not completely clear (Dietz et al. 2007, Joseph et al. 2002, Nordin & Gillbert 1998), i.e. the relationship between applied intervention, autistic symptoms and changes in IQ is not entirely explained yet (Ben-Itzhak et al. 2008). This paper will present a survey of literature on IQ stability in children with CA in the last ten years, as well as a review of possible causes influencing (in)stability of IQ in children with CA.

SUBJECTS AND METHODS

To carry out a survey of literature in the last ten years we used the online database "PubMed". We believed it would be sufficient to use it because among other things it contains the two most important journals in the field of autism: the journal "Autism" and the journal "Journal of Autism and Developmental Disorders". By putting in the following key words: (autism and IQ and child) and (stability or outcome or follow-up), we obtained the total of 78 references (December 2008). Out of those 78 references we left out the papers with the following criteria (exclusion criteria): they were not original studies (review articles), the paper did not deal with the CA diagnosis in the narrower sense (other subtypes within a broader category of PDD were not included, unless used in studies and compared to the CA diagnosis), the study was not longitudinal and did not cite specific IQ findings. Out of the total of 78 citations, we included 25 papers in this survey. In two cases it was the matter of the same study with two references (Bibby et al. 2001, 2002, Howlin et al. 2000, Mawhood et al. 2000). Thus we obtained a total of 23 studies. The list of omitted references not mentioned in this paper in line with the exclusion criteria, the total of 53, can be obtained upon request from the first author.

RESULTS

In reviewing the longitudinal studies we divided the 23 studies into four groups according to the study design, although there might be an overlap between them, (Tables 1 to 4): comparison of treatment, application of interventions, comparisons of groups and the follow-up studies.

As seen from the tables, the number of examinees in certain groups is really small, sometimes even less than 20 examinees, what somewhat discredits this study, so that the results of the studies should be taken with a pinch of salt. The mean age of the children at the beginning was 61 months for treatment comparison studies, 46 months for the intervention application studies, 59 months for the group comparison and 55 months for the follow-up studies. The duration of studies differs as well. In the comparison of treatment studies the average follow-up is 2.3 years, in the application of intervention studies the average follow-up is 3 years, in the comparison of groups studies the average follow-up is 3.8 years, in the

follow-up studies it amounts to the average of 8.3 years. Various cognitive tests are applied, what can influence the results as well. In the largest number of studies Wechsler type cognitive test was used, and also Bayley's test and Stanford Binet test (see Tables 1 to 4). The average initial IQ for the studies of treatment comparison was about 72 (nonverbal IQ included), the average initial IQ for the studies of intervention application was around 60, for the studies of group comparison it was about 74.5 (both nonverbal IQ and developmental point included), while for the follow-up studies the average initial IQ was about 66 (included were both verbal and nonverbal points, and developmental quotient).

In total there were 17 studies measuring full scale IQ (Tables 1 to 4). Six studies have been found measuring only verbal IQ and/or non-verbal IQ (Charman et al. 2005, Drew et al. 2002, Eaves & Ho 2008, Howlin et al. 2000, Mawhood et al. 2000, Howlin et al. 2004, Stevens et al. 2000), i.e. only non-verbal IQ was found in three studies (Charman et al. 2005, Drew et al. 2002, Stevens et al. 2000), whilst simultaneously non-verbal and verbal IQ is mentioned in three studies (Eaves & Ho 2008, Howlin et al. 2000, Mawhood et al. 2000, Howlin et al. 2004), while a study by Eaves & Ho (2004) measured full scale IQ with verbal IQ. Therefore, in these seven studies we had a total of four verbal IQ and six non-verbal IQ. Verbal IQ remains the same in two studies (Eaves & Ho 2004, 2008), in two it is increased (Howlin et al. 2000, Mawhood et al. 2000, Howlin et al. 2004). Non-verbal IQ remains the same in five studies (Charman et al. 2005, Drew et al. 2002, Eaves & Ho 2008, Howlin et al. 2004, Stevens et al. 2000), while it is decreased in one study (Howlin et al. 2000, Mawhood et al. 2000).

It seems particularly interesting to us that we tried to sum up the individual findings of various studies, despite numerous difficulties. It appeared that individual findings in these studies were not systematically presented, certain authors did not separately cite the dynamics of change/persistence of IQ. Also, some authors stuck more to final results, sometimes not presenting statistical values of significance, some considered important the increase/decrease of more than 15 IQ points, while some others considered important more than 20 IQ points. However, in some studies, individual findings for each particular child are clearly cited, as seen from the tables. When the authors did not calculate statistical values of significance by

themselves, we considered the increase/decrease of more than 15 points as important. In only 12 studies out of 23 individual findings are cited.

The first category of studies refers to the comparison of treatment (Table 1). The following therapies were compared: intensive behavior therapy, special classes, parental training, therapy in local services, behavioral therapy, eclectic therapy, lego therapy, as well as other specific treatments. General findings show the important IQ increase in several studies (Cohen et al. 2006, Eikeseth et al. 2007), while some studies do not find important changes (Cohen et al. 2006, Drew et al. 2002, Eikeseth et al. 2007, Legoff & Sherman 2006, Magiati et al. 2007).

The second category of studies deals with the intervention application (Table 2). General data show important IQ increase in several studies (Beglinger & Smith 2005, Ben-Itzhak & Zachor 2007, Harris & Handleman 2000), while some studies do not find important changes (Bibby et al. 2001 and 2002, Jónsdóttir et al. 2007).

The third category comprises studies of group comparison (Table 3). General findings speak about important IQ increase in two studies (Ben-Itzhak et al. 2008, Howlin et al. 2000 and Mawhood et al. 2000), some studies do not find more important changes (Cohen et al. 2003, Dietz et al. 2007, Fisch et al. 2002, Howlin et al. 2000 and Mawhood et al. 2000, Starr et al. 2003, Takeda et al. 2007, Yang et al. 2003), but some do cite decrease in IQ (Cohen et al. 2003, Fisch et al. 2002, Howlin et al. 2000 and Mawhood et al. 2000).

The fourth category deals with follow-up studies (Table 4). General findings argue about important IQ increase in one study (Howlin et al. 2004), the majority of studies do not find important changes (Charman et al. 2005, Eaves & Ho 2004, 2008, Howlin et al. 2004, Stevens et al. 2000).

Depending on the study, at the individual level, a similar trend is observed as in the general results. Depending on the study from the individual point of view, the increase in IQ is registered, and/or the findings of average IQ are found with up to 57% examinees, i.e. 12 out of 21 examinees (Cohen et al. 2006), IQ remains the same with up to 87.5% examinees, i.e. 14 out of 16 (Yang et al. 2003), while IQ decreases with up to 44% examinees, i.e. in four out of nine (Howlin et al. 2000, Mawhood et al. 2000). These findings, as already stressed, should be taken cautiously, because the numbers of examinees is small in total.

Table 1. The survey of longitudinal studies measuring IQ values in children with autism – design of the study of treatment comparison

Authors	TC	CA	DS	Cognitive tests	Findings
Cohen et al. 2006	Intensive behavior therapy (N=21) and special classes (N=21)	30 and 33	3	Bayley 1993, Merrill- Palmer 1948, WPPSI 1989	Intensive behavior therapy: i-IQ was 62, f-IQ was 87; special classes: i-IQ was 59, f-IQ was 73
Drew et al. 2002	Parents training (N=12) and local service (N=12)	23	1	Griffiths scale (D and E subscale) 1986	Parents training: i-NIQ was 88, f-NIQ was 78; local service: i-NIQ was 66, f-NIQ was 66
Eikeseth et al. 2007	Behavior therapy (N=13) and eclectic therapy (N=12)	66	2.5	Bayley 1993, WISC 1974, WPPSI 1989	Behavior therapy: i-IQ was 62, f-IQ was 87; eclectic therapy: i-IQ was 65, f-IQ was 72;87 regarding to 65 p<0.05
Legoff & Sherman 2006	Lego therapy (N=60) and control therapy (N=57)	111 and 121	3	WISC 1991, WPPSI 1989	Lego therapy: i-IQ was 85, f-IQ was 91; control therapy: i-IQ was 86, f-IQ was 87
Magiati et al. 2007	Intensive behavior therapy (N=28) and specific therapy (N=16)	40	2	Bayley 1993, Merrill- Palmer 1948, WPPSI 1990	Intensive behavior therapy: i-IQ was 83, f-IQ was 78; specific therapy: i-IQ was 65, f-IQ was 65

Authors	Individual findings
Cohen et al. 2006	Intensive behavior therapy: 12 cases (57%) finally had an average IQ; Special classes: 7 cases (33%) finally had an average IQ; other findings are not cited
Drew et al. 2002	No findings
Eikeseth et al. 2007	Behavior therapy: 7 cases (54%) finally had an average IQ; Eclectic therapy: 3 cases (25%) finally had an average IQ
Legoff & Sherman 2006	No findings
Magiati et al. 2007	Intensive behavior therapy: In about 50% cases IQ remains the same, in about 3% cases it significantly decreases, in about 5% cases it significantly increases; Specific therapy: In about 40% cases IQ remains the same, in about 3% cases it significantly decreases, in about 5% cases it significantly increases (the number of cases are not cited)

Abbreviations:

TC - Treatment comparison and the number of examinees;

CA- Chronologic age in months at the beginning of the study;

DS- Duration of the study in years;

i-IQ – initial IQ; f-IQ – final IQ; i-NIQ - initial nonverbal IQ; f-NIQ - final nonverbal IQ;

WISC - Wechsler Intelligence Scales for Children;

WPPSI - Wechsler Preschool and Primary Scales of Intelligence

Table 2. The survey of longitudinal studies measuring IQ values in children with autism – design of the study of intervention application

Authors	NE	CA	DS	Cognitive tests	Findings
Beglinger & Smith 2005	N=37	66	2	Bayley 1993, WPPSI 1989	i-IQ was 54, f-IQ was 73 (N=30)
Ben-Itzhak & Zachor 2007	N=25	27	1	Bayley 1993, Stanford Binet 1986	i-IQ was 80, f-IQ was 88 p < 0.001
Bibby et al. 2001 & 2002	N=66	45	2.5	Bayley 1993, Merrill- Palmer 1948, WISC 1991, WPPSI 1990	i-IQ was 51, f-IQ was 55 (N=22)
Harris & Handleman 2000	N=27	49	4 and 6	Stanford Binet 1986	i-IQ was 59, f-IQ was 78
Jónsdóttir et al. 2007	N=41	41	2.5	Bayley 1993, WPPSI 1989	i-IQ was 57, f-IQ was 61

Authors	Individual findings
Beglinger & Smith 2005	No findings
Ben-Itzhak & Zachor 2007	No findings
Bibby et al. 2001 & 2002	In 6 cases the f-IQ increases (27%); in 14 cases it remains the same (64%); in 2 cases the f-IQ decreases (9%)
Harris & Handleman 2000	In 15 cases the f-IQ increases (55,5%); in 12 cases it remains the same (44%)
Jónsdóttir et al. 2007	In 7 cases the f-IQ decreases (17%); in 22 cases it remains the same (54%); in 12 cases the f-IQ increases (29%)

Abbreviations:

NE - The number of examinees;
 CA - Chronologic age in months at the beginning of the study;
 DS - Duration of the study in years;
 i-IQ - initial IQ; f-IQ - final IQ;
 WISC - Wechsler Intelligence Scales for Children;
 WPPSI - Wechsler Preschool and Primary Scales of Intelligence

Table 3. The survey of longitudinal studies measuring IQ values in children with autism – design of the study of group comparison

Authors	GC	CA	DS	Cognitive tests	Findings
Ben Itzhak et al. 2008	Children with autism (N=44) and children with developmental disabilities (N=37)	26	1	Bayley 1993, Stanford Binet 1986	Children with autism i-IQ was 75; f-IQ was 90
Cohen et al. 2003	Children with autism: Low activity MAO-A allele (N=16) and high activity allele (N=25)	51	1	Griffiths 1984	Low activity MAO-A allele: i-IQ was 61; finally IQ decreases $p < 0.03$; High activity allele: i-IQ was 82 and f-IQ remains the same
Dietz et al. 2007	Children with autism N=39; children with mental retardation (N=14) and control (N=36)	24	2	Mullen 1995	Children with autism: i-IQ was 65; f-IQ was 72
Fisch et al. 2002	Children with autism (N=18) and children with fragile X chromosome (N=18)	36 to 14 to 4	2-3	Stanford Binet 1986	Children with autism: For group tested before the age of 6: i-IQ was 52, f-IQ was 43.0 $p < 0.05$; For group tested at or after the age of 6: the f-IQ remains the same
Howlin et al. 2000 & Mawhood et al. 2000	Children with autism (N=18) and children with receptive language disorders (N=18)	84 to 96	17	Raven's matrices 1956, WAIS 1981, WISC 1949 & 1974	Children with autism: i-VIQ (N=9) was 67; f-VIQ was 82 - $p < 0.012$; i-NIQ (N=18) was 94, f-NIQ was 83 - $p < 0.001$; According to Raven's matrices (N=11) i-IQ was 114, f-IQ was 101- NS
Starr et al. 2003	Children with autism without mental retardation (N=41) & Asperger syndrome (N=17)	48 to 72	2	Leiter 1948, Stanford Binet 1986	Children with autism: i-IQ was 86; f-IQ was 82
Takeda et al. 2007	Children with autism (N=49) and children with other pervasive disorder (N=77)	24	3	Kyoto skala 1985, Tanaka-Binet 1987	Children with autism: initial developmental score was 59, final score was 52; Children with other pervasive disorder: initial developmental score was 65, final score was 66
Yang et al. 2003	Children with autism (N=16) and control (N=16)	44	2	Bayley 1993, Leiter 1997, WISC 1991, WPPSI 1989	Children with autism: i-IQ was 74; f-IQ was 80

Authors	Individual findings
Ben Itzhak et al. 2008	No findings
Cohen et al. 2003	No findings
Dietz et al. 2007	Children with autism: In 12 cases the final IQ increases (31%); in 24 cases it remains the same (62%); in 3 cases the IQ decreases (8%)
Fisch et al. 2002	No findings
Howlin et al. 2000 & Mawhood et al. 2000	Children with autism (N=18): in nonverbal points in 10 cases (55%) f-IQ remains the same; in 8 (44%) cases f-IQ decreases; Children with autism (N=9): in verbal points in 5 cases (55%) the f-IQ remains the same; in 4 (44%) cases the f-IQ increases
Starr et al. 2003	No findings
Takeda et al. 2007	No findings
Yang et al. 2003	Children with autism (N=16): in nonverbal points in 2 cases (12.5%); f-IQ increases more than 20 points; in 14 cases the f-IQ remains the same (87.5%)

Abbreviations:

GC - Group comparison and the number of examinees; CA- Chronologic age in months at the beginning of the study;
DS- Duration of the study in years;
i-IQ – initial IQ; f-IQ – final IQ; i-NIQ - initial nonverbal IQ; f-NIQ - final nonverbal IQ;
i-VIQ - initial verbal IQ; f-VIQ - final verbal IQ; NS- non significant;
WISC - Wechsler Intelligence Scales for Children; WPPSI - Wechsler Preschool and Primary Scales of Intelligence

Table 4. The survey of longitudinal studies measuring IQ values in children with autism – design of the study of the follow-up

Authors	NE	CA	DS	Cognitive tests	Findings
Charman et al. 2005	N=26	24	5	Griffith (D and E subscale) 1986	Nonverbal IQ in the second year of life was 75, in the third year of life was 73, in the seventh year of life was 71
Eaves & Ho 2004	N=49	33	2.5	Bayley 1993, Leiter 1948 & 1997, Mullen 1997, Stanford Binet 1986, Vineland 1984, WPPSI 1989	Children with autism: i-IQ (N=34) was 52, f-IQ was 54; Children with autism: i-VIQ (N=36) was 32, f-VIQ was 38
Eaves & Ho 2008	N=76	78	4.6	Bayley 1969, Leiter 1952, WISC 1974, WPPSI 1967	Verbal and nonverbal IQ remains the same
Howlin et al. 2004	N=68	84	29	Leiter 1982, Merrill- Palmer 1948, Raven's matrices 1976, Stanford Binet 1961, WAIS 1981, WISC 1974, WPPSI 1990	i-NIQ was 80, f-NIQ was 75; i-VIQ was 61, f-VIQ was 70 - $p < 0.17$
Stevens et al. 2000	N=138	54	To 4.5	Bayley 1969, Stanford Binet 1986	In the first subgroup i-NIQ was 66, f-NIQ was 66. In the second subgroup i-NIQ was 94, f-NIQ was 106

Authors	Individual findings
Charman et al. 2005	No findings
Eaves & Ho 2004	In about one third the f-IQ increases in 20 points; in about one third the f-IQ decreases in 20 points (other findings are not cited)
Eaves & Ho 2008	In 50% cases the i-VIQ was >50; in 61% cases i-NIQ was >50; In 47% cases the f-VIQ was >50; In 57% cases the f-NIQ was >50; (other findings are not cited)
Howlin et al. 2004	In nonverbal points: in 31 cases (46%) f-IQ remains the same; In 11 cases (16%) f-IQ increases; in 26 cases f-IQ (38%) f-IQ decreases; In verbal points: in 34 cases (50%) f-IQ remains the same; In 29 cases (43%) f-IQ increases; in 5 cases f-IQ (7%) f-IQ decreases
Stevens et al. 2000	No findings

Abbreviations:

NE - The number of examinees; CA- Chronologic age in months at the beginning of the study;

DS- Duration of the study in years;

i-IQ – initial IQ; f-IQ – final IQ; i-NIQ - initial nonverbal IQ; f-NIQ - final nonverbal IQ; i-VIQ - initial verbal IQ; f-VIQ - final verbal IQ;

WISC - Wechsler Intelligence Scales for Children; WPPSI - Wechsler Preschool and Primary Scales of Intelligence

DISCUSSION

Longitudinal studies of the IQ points to stability

The aforesaid studies presented in this review stress as important the longitudinal individual follow-up of autistic symptom̄s, cognition and adaptable behavior, communication, the follow-up of stability and changes in children with autism, the administration of intensive therapy as early as

possible, as well as the application of adequate methods of schooling. To sum up, the average initial IQ point is found in the category ranging from borderline intelligence to mild mental retardation. Out of the total of 23 studies, the majority, 19 of them generally argue that there are no changes in IQ, eight studies speak about an increase in IQ, while five studies observe a decrease in IQ (in some studies different results

were registered simultaneously). Depending on the study, from the individual level, a similar trend is observed as in general results.

Most studies used full scale IQ score (the total of 17 studies), which can be considered a significant guideline in monitoring the children with autism. By comparing verbal and non-verbal IQ, the trend has shown that non-verbal tended to stay the same or decrease whereas verbal IQ showed the trend of remaining the same or increasing, which corresponds to the general idea that children with CA have a higher non-verbal score at the beginning (Lincoln et al. 1995), however with time the assimilation of verbal and non-verbal IQ score occurs (which in practice actually means some increase in the verbal IQ score) (Joseph et al. 2002). A particularly interesting study was by Howlin et al. (2004) who in their work suggest the higher stability of non-verbal IQ, i.e. that a number of different factors should be researched which could affect the stability/change of IQ score in children with autism.

All the studies mentioned in this review have administered a particular therapy, this especially applies to studies cited in tables 1 and 2. This is, for the time being, one of the most important guidelines of the above cited studies, which is in concordance with other papers (Volkmar & Pauls 2003). Regarding the empirical foundation of the outcome of intervention studies, it is to be expected that there will be more and more persons with CA who will progress. Within those new facts in relation to various outcomes, possible future guidelines might be directed towards determining the subtypes of children with CA according to the course of the disorder.

We are aware of the fact that sometimes a rise in the IQ scores does not necessarily mean the overall improvement of functioning (Mahwood et al. 2000). In fact, the increase in the IQ score came often collaterally with the regression of autistic symptoms, which is congruent with other research of the relation of IQ and autistic symptoms (Joseph et al. 2002).

According to the mentioned studies in this review, it is therefore possible that a certain child progresses well. That is: during follow-up the child may lose the criteria for e.g. MR or CA. This leads us to the revision of the diagnostic criteria during follow-up of children (Jónsdóttir et al. 2007). Moreover, with this related progress, there will be

a growing possibility for children to attend regular instead of special school, what can have an important positive impact for parents and for a whole family (Niederhofer 2006). This is also the topic of the work of some authors (Harris & Handleman 2000).

Possible causes of IQ changes in the course of time

Why does the IQ of a particular child regress, while in another child it remains the same, and in still another IQ points increase?

The studies so far have pointed to the changed IQ in the course of time in children with CA, because it probably depended on: Developmental maturation (Dietz et al. 2007, Matson 2007), and/or environmental influences (family climate, applied therapy and other factors) (Ben-Itzhak et al. 2008, Harris & Handleman 2000, Jónsdóttir et al. 2007, Lovaas 1987).

Thus it seems that the measured altered IQ point really measures the factually changed IQ (Matson 2007). However, on the other hand some other factors which could influence the IQ changes should be taken into account as well.

Firstly, it is possible that one part of the IQ change could be attributed to various psychological tests applied for measuring cognitive capacities in various periods, as discussed by Magiati & Howlin (2001), Manson (2007) and Rapin (2003). Otherwise, it is not unusual in the literature to use more varied tests, because each individual test is applied according to the child's age (as seen in the tables). Secondly, a very high variability of cognitive testing is known at the earliest age (Rapin 2003), i.e. it is known that in children with CA there exists an irregular pattern of cognitive abilities (Joseph et al. 2002). At the earliest age the development of the brain is susceptible to high plasticity, when great changes could be expected (Ben-Itzhak et al. 2008, Dietz et al. 2007, Rapin 2003), which leads to high individual variability. Thirdly, besides the importance of using the instruments internationally, it is also important that they are socio-culturally adequate. Rapin (2003) discussed these problems as well, and suggests that tests should be culturally compatible. Fourthly, the results strongly depend on the preparedness of a person testing children with CA, about his/her experience, i.e. whether good collaboration and attention of a child is established (Rapin 2003). Some authors warn however that tests have their

limitations related to the estimation of outcome regarding an individual case (Rapin 2003), that the predictive value of IQ measurements at the earliest age is unstable (Matson 2007), and that the only clear goal in the pre-school period, for any child in the spectrum of autistic disorders, is actually habilitation (Rapin 2003).

CONCLUSION

The majority of studies state that the IQ points will remain the same, which suggests the stability of IQ scores. Although therapeutic effects could not be empirically proved in all the studies, today the generally accepted opinion is that intensive and early therapy should be applied. If possible, it is advisable to use the same IQ points measuring tests over time. It is advisable that the diagnostics, therapy and follow-up are performed by persons who have long experience in their application. Diagnostic criteria should be revised over time. Some children with good progress have the possibility of attending regular school.

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