It's About Time -
Comparing the Sense and Management of Time
in Children with ADHD and ASD

Laura Saloluoma, 28979 & Camilla Walden, 25549

Master's Thesis in Psychology

Supervisors: Thomas Nyman, Susanna Salomäki & Jarno Tuominen

Faculty of Arts, Psychology and Theology

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Author: Laura Saloluoma & Camilla Walden
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Abstract: An abnormal sense of time has been linked with several developmental disorders such as attention-deficit/hyperactivity disorder (ADHD) and Autism Spectrum Disorder (ASD). Earlier research has mainly focused on measuring time perception through different time production, reproduction and estimation tasks, while less focus has been placed on how parents perceive and report the time perception of their own children in everyday life. The focus of the study was to find out whether there are differences between how parents of the three groups (ADHD, ASD and typically developing children, TDC) rate their children's sense of time with the It's About Time, Parent Form -Revisited (IAT-PF-R) -questionnaire, created by Russell A. Barkley (1998). Our sample consisted of 29 children diagnosed with ADHD, 17 ASD children diagnosed with Asperger Syndrome and 20 typically developing children. The two diagnostic groups differed significantly from the typically developing children in impulsivity, $F(2, 61) = 12{,}635$, $p=.000$, $\eta 2 =.36$. Our results show that ADHD subjects seem to experience more difficulties in forward planning with their everyday activities than the TDC, $F(2, 61) = 10.421$, $p=.000$, $\eta 2 =.25$. The difference between the groups with ASD and ADHD in ability to plan forward was in line with the hypothesis; however, the difference was not significant. This warrants future attention. We found no significant differences between the groups with ADHD and ASD and the TDC group on the ability to comprehend past, present and future events.
Keywords: Autism Spectrum Disorders, Asperger Syndrome, attention-deficit/hyperactivity disorder, ADHD, Sense of time, time perception
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Abstrakt: Neuropsykiatriska funktionsnedsättningar såsom aktivitets– och uppmärksamhetsstörning (ADHD) och autismspektrumtillstånd (AST) har kopplats ihop med en bristande känsla för tid. Tidigare forskning inom ämnet har fokuserat på att mäta barns tidsuppfattning genom tids produktion och reproduktions uppgifter samt genom tidsuppskattningar. Mindre uppmärksamhet har lagts vid hur föräldrarna uppfattar barnens begränsade känsla för tid i vardagen. Denna studie undersöker hur föräldrarna till barnen i de tre grupperna (ADHD, AST samt normalt utvecklade barn) rapporterar om sina barns tidsuppfattning med hjälp av frågeformuläret It's about time. Sample bestod 29 barn diagnostiserade med ADHD, 17 barn diagnostiserade med Aspergers syndrom och 20 normalt utvecklade barn. De två grupperna (ADHD och ASD) skilde sig signifikant från kontrollgruppen i impulsivitet; förmågan att beakta framtida konsekvenser i beslutsfattandet, $F(2, 61) = 12{,}635$, $p=.000$, $\eta 2 =.36$. Enligt resultaten verkar personer med ADHD uppleva fler svårigheter med att planera framåt i sina dagliga aktiviteter än de normalt utvecklade barnen, $F(2, 61) = 10.421$, $p=.000$, $\eta 2 =.25$. Skillnaden mellan grupperna ASD och ADHD i förmågan att planera framåt var i linje med vår hypotes, men icke signifikant. Resultaten visade inga signifikanta skillnader mellan ADHD och ASD och de normalt utvecklade barnen på förmågan att uppfatta tidsdimensionerna; dåtid, nutid och framtid.
Nyckelord: autismspektrumtillstånd, Aspergers syndrom, uppmärksamhetsstörning/hyperaktivitetsstörning, ADHD, känsla för tid, tidsuppfattning
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1. Introduction

The essence of time-related behavior and experiences was one of the early themes in scientific psychology at the end of the 19th century (Block, 1990) and this interest has continued until today. Studying temporal processing in clinical populations has been an essential part of time perception research, providing information both about the psychological consequences of pathological conditions on temporal processing, and on mechanisms of temporal processing in typical development. (Vatakis & Allman, 2015).

While earlier research has focused on measuring time perception through different kinds of time production, re-production and estimation tasks, less attention has been paid to how children perceive time in everyday settings and how possible deficits in time perception manifest themselves. Although test sets in experimental contexts have many benefits, their results do not necessarily correlate very well with managing the problems of time perception in everyday situations (Quartier, Zimmerman & Nashat, 2010; Zakay, 2005). Thus, research focusing on the challenges of time perception in everyday settings can be seen to be of clinical importance.

Our research contributes to this area of research, as we focus on studying the perception of time in children with either a diagnosis of attention deficit hyperactivity disorder (ADHD) (F90.0) or ASD children diagnosed with Asperger Syndrome (AS) F84.5 (World Health Organization, WHO, 2016) in everyday settings. These developmental disorders differ in diagnostic characteristics. The basic features of ADHD include inattention, hyperactivity and impulsivity, whereas ASD and AS are characterized by difficulties in social interaction, and restricted, repetitive behaviors and interests (American Psychiatric Association, APA 2013; WHO 2016. The two developmental disorders are, however, suggested to share a common feature; an abnormal time perception (Allman & Falter, 2015; Quartier et al., 2010).

1. 1. Attention Deficit Hyperactivity Disorder (ADHD)

The earliest reference to symptoms presently associated with ADHD was made in the medical literature by physician Melchior Adam Weikard in 1775 (Barkley, Peters, & Weikard, 2012). Since then the same symptoms have been assigned various diagnostic labels, eventually leading to the condition now known as ADHD being included in the second edition of DMS in 1968, with/under the name Hyperkinetic Disorder of Childhood. The definition has changed in following editions of the DSM according to the evolution in diagnostic nomenclature and delineation of subtypes (Kos & Richdale, 2004).

According to the current classification system, the Diagnostic and Statistical Manual of Mental Disorders, 5th edition **(**DSM-5) and the International Statistical Classification of Diseases and Related Health Problems, 10th edition (ICD-10), ADHD is characterized by inattention, hyperactivity and impulsivity (APA, 2013; WHO, 2016). Since DSM-III, diagnostic specifiers are used to identify which of the two subtypes of ADHD people primarily belong to according to their symptoms: inattentive or hyperactive-impulsive. Some people can also show symptoms belonging to both subtypes (Barkley, 2015). Inattentiveness is displayed by problems in paying attention to details, sustaining attention in tasks or playing activities, following through on instructions, organizing tasks and activities, finishing schoolwork, chores, or duties. Symptoms also include making careless mistakes, not seeming to listen when spoken to directly, losing things necessary for tasks or activities, being easily distracted by extraneous stimuli, forgetful in daily activities and disliking engaging in tasks that require sustained mental effort. Hyperactivity includes symptoms such as fidgeting with hands or feet, squirming in seat, leaving seat, running about or climbing excessively, when this is unsuitable (this may be manifested as a feeling of restlessness in adults and adolescents), having problems taking part in leisure activities quietly,

having problems being still for longer periods of time and talking excessively. Impulsivity, in turn, manifests itself in answering questions before they have been completed, having problems in waiting for one's own turn and disturbing others (Barkley, 2015 & APA, 2013).

According to DSM-5 criteria six or more of the symptoms are required (for older adolescents and adults aged 17 and older, at least five symptoms are required), which must have developed before the age of 12 and continued for six months or more to the extent that it can be seen to contradict the person's level of development, has a negative effect on social and academic/occupational activities and interferes with the individual's functioning in two or more settings (APA, 2013). Prevalence rates of ADHD vary depending on the diagnostic criteria, source of information, and requirement of impairment for the diagnosis used in the studies (Polanczyk, Willcutt, Salum, Kieling & Rohde, 2014). DSM-5 estimates that 5.0% of children and 2.5% of adults have ADHD (APA, 2013). There are gender differences in prevalence as males display more symptoms of ADHD than females (Polanczyk, De Lima, Horta, Biederman & Rohde, 2007). There is no recent estimate of the prevalence of ADHD in childhood in Finland, but the prevalence rate according to the DSM-III classification in 1989 was 7% in 8-year-olds (Almqvist et al., 1999) and according to the DSM-IV classification in Northern Finland in year 1986 among 16- to18-year-olds 8.5% (Smalley et al., 2007).

1.2. Autism Spectrum Disorder (ASD)

Asperger syndrome was first defined by physician Hans Asperger in year 1944. Not aware of each other's writings both he and another physician, Kanner (1943), used the term "autistic" to describe a group of children with similar difficulties in social interaction, and restricted, repetitive behaviors and interests. However, in the group studied by Asperger speech delays were less common but motor deficits more prevalent, and the problems had a later onset

than in Kanner's group. The term autism was later identified only with the group Kanner described (Barahona-Corrêa & Filipe, 2016; Shea, Adams & Mesibov, 2002). Asperger's work stayed practically unknown almost until the first English translation of his research article was published (Frith, 1991). AS had by that time, however, been described by Lorna Wing (1981). She suggested the term Asperger syndrome be applied to a subgroup of children characterized by impairment in social interaction, social isolation, age appropriate or ahead of age in language acquisition with better than usual level language skills but slight deviation in (both verbal and non-verbal) communication, narrow focus of interests, overachievement in specific cognitive domains, repetitive activities, resistance to change and motor clumsiness (Barahona-Corrêa & Filipe, 2016; Wing, 1981).

Similarly to autism, the diagnosis of AS includes qualitative deficiencies in reciprocal social interaction and restricted, repetitive, stereotyped patterns of behavior, interests, and activities. AS differs from autism above all in that there is no general delay or retardation in language or cognitive development (APA, 2013; WHO, 2016). As autistic disorder, AS persists into adulthood, but whereas autism is usually manifest before the age of 3, AS is often first apparent at preschool age (Khouzam, El-Gabalawi, Pirwani & Priest 2004). The diagnosis of autism and AS is undergoing a change as the ICD-10 is being replaced by the ICD-11 in 2022. The individual diagnoses of autism, AS, atypical autism and disintegrative developmental disorder will be replaced by the umbrella diagnosis "autism spectrum disorder". This change was preceded by changes in diagnosis of autism in the DSM-5 (APA, 2013), which were made because the boundaries between different autism diagnoses were unclear and research has not provided evidence of any significant difference between autism and AS (Autismiliitto).There are only a few epidemiological studies of AS, but its prevalence can be estimated to be about 2.5/10

000 (Fombonne, 2003). In an epidemiological study of 8-year-old children in Finland (Mattila et al., 2007) the overall prevalence rate for AS was 4.3/1000, according to any of the four diagnostic criteria used in the study (DSM-IV, ICD-10, Ehlers & Gillberg, 1993; Gillberg, 1991; Gillberg & Gillberg, 1989 & Szatmari, Bremner & Nagy, 1989).

1.3. Perception of Time

Cummings (1922, p. 46) wrote in his novel: "Time is what keeps everything from happening at once". Understanding time and the passing of time is certainly one of the crucial cognitive skills in society. While we are often not aware of time in itself, we seem to experience time as a relation between events and as an order of things: something that has happened, something that is happening now or something that is going to happen in the future (Benovsky, 2013; Campbell, 1994; Tulving, 2002). Interestingly, the linear perception of time is not shared across all cultures – several cultures operate according to a circular time orientation where events are seen as occurring repeatedly in cyclical patterns (Graham, 1981). Whichever perception of time one operates with, a sense of time creates the possibility to navigate the world in an accurate way.

Toplak, Rucklidge, Hetherington, John and Tannock (2003, p. 888) define perception of time as "an adaptive function that facilitates the ability to predict, anticipate, and respond efficiently to coming events". In typically developing children, time perception evolves from early childhood: infants are not only able to perceive the time between two events, but also the duration of these events (Droit-Volet, 2013). The perception of time also improves with age. Increased sensitivity to time may be a result of improved inhibition of motor responses as well as a result of reduction of impulsivity. The precision of time processing is arguably also dependent on attention and working memory functions (Droit-Volet, 2013).

Distinct brain regions have been recognized to be involved in time perception. In their review, Rubia and Smith (2004) list brain regions connected with different timing functions. They mention, among others, the dorsolateral prefrontal cortex, inferior prefrontal cortex, anterior cingulate gyrus with the supplementary motor area, as well as the inferior parietal lobes, the cerebellum and the basal ganglia. In earlier research time perception has usually been measured with time estimation, time discrimination, time production and reproduction tasks (Quartier et al., 2010).

Timing is defined by Noreika, Falter and Rubia (2013, p. 235) as "the ability to deal with temporal domain in behavior to specific timeframes, the ability to perceive and estimate time intervals, and the ability to consider future consequences of behavior in order to make use of temporal foresight for intertemporal choices". Timing functions have commonly been divided into three categories: motor timing, perceptual timing and temporal perspective (Noreika et al. 2013). Motor timing refers to the organization of motor behavior in an accurate temporal frame and motor timing performance is highly time-sensitive. Perceptual timing has to do with the ability to estimate the duration of an attended temporal interval and it is hypothesized to be dependent on the working memory. Temporal perspective refers to the skill of taking past, present and future incidents in to consideration in future planning. The deficits in perceptual timing are speculated to affect reasoning in everyday situations (Carelli & Wiberg, 2012).

Timing has an important role in different everyday activities, such as walking and speaking – we can engage in these activities because we process and use temporal information across a wide range of intervals (Buhusi & Meck, 2005). Two often used concepts in research on timing are sub-second (milliseconds) and supra-second (several seconds) range. The general hypothesis, supported by research, is that different neural systems are used to measure temporal

durations at the sub-second and supra-second ranges (Lewis & Miall, 2003). These two different timing ranges have different tasks: sub-second range timing plays a role in the motor control and the speech production and the supra-second range interval timing plays a part in foraging, decision making, and mental estimation of time (Buhusi & Meck, 2005; Hore, Wild, & Diener, 1991). Research findings indicate relatively automatic procession of sub-second durations, compared to supra-second durations, which require more cognitive control (Wiener, Turkeltaub, & Coslett, 2010).

1.3.1. Time Perception in Children with ADHD

Children with ADHD demonstrate symptoms of inattention, impulsivity and hyperactivity. These primary diagnostic characteristics of the disorder are often accompanied by secondary difficulties in a broad range of timing functions (Noreika et al., 2013). Already in 1925, the French psychologist Henri Wallon had made an observation that unruly children seemed to have problems in perceiving past and present events accurately and they seemed to experience a sort of time confusion (Wallon, 1925, as cited in Quartier et al., 2010). Parents of ADHD children often report that their children seem to have difficulties in managing time, such as being consistently late or having problems understanding units of time (Houghton, Durkin, Ang, Taylor & Brandtman, 2011).

Time discrimination deficits in children with ADHD have been well covered in research (Barkley, Koplowitz, Anderson & McMurray, 1997; Smith, Taylor, Rogers, Newman, & Rubia, 2002). Deficits have been found in how children with ADHD perform in tasks that measure time production, time reproduction and motor timing (Toplak, Dockstader, Tannock, 2006; Smith et al., 2002). According to Noreika et al. (2013, p.260), the most consistent deficits in ADHD seem to affect “sensorimotor synchronization, duration discrimination, duration reproduction and

delay discounting tasks". In a recent study (Marx et al., 2017), children with ADHD experienced a general timing deficit not restricted to a specific timing task. The children had difficulties in correctly producing, estimating and discriminating time intervals compared to controls. However, there was a significant difference only between the time production and time estimation tasks. Houghton et al. (2011) assessed temporal regulation in children with and without ADHD with a parent report measure. The results suggest that children with ADHD have difficulties in temporal organization and management in their everyday life. According to Quartier et al. (2010) parents of children with ADHD often report their children having a poor sense of time. Both researchers such as Barkley (2015), and ADHD support groups (see for example Lewis, 2019) sometimes use the term "time blindness" to describe the phenomenon of having difficulties in managing time spans correctly.

Barkley (1997) suggested that problems with the working memory can affect the development of a sense of time in children with ADHD. As to neurophysiological mechanisms behind problems in time perception in ADHD, the abnormal fronto-parietal and fronto-striato-cerebellar networks in ADHD individuals seem to mediate the found defects in a broad range of timing tasks. ADHD can, thus, at least partly be seen as a disorder of an abnormal temporal processing (Noreika et al., 2013).

The existing evidence of altered time perception could be used to improve the diagnostic criteria of ADHD as well as help to improve the recognition of the symptoms in clinical settings. Ptacek et al. (2019) suggest that the findings could also be used in reforming the clinical approach as well as in symptom management. Additional research on how these deficits manifest themselves in the children's everyday life would be an important addition to the previous

research. The results from a laboratory setting may not accurately reflect the functioning of these children in everyday life.

1.3.2. Perception of Time in Children with ASD

Compared to ADHD, less focus has been paid on how people within the autism spectrum disorders (ASD) perceive time. While both self-reports and reports from people (parents, teachers, and clinicians) having regular contact with people with ASD indicate that they often struggle with time perception and sense of time, relatively few studies have focused on researching the topic (Allman & Falter, 2015; Overweg, Hartman & Hendriks, 2018). While research clearly indicates abnormal time processing in ASD, the evidence is quite sparse and diverse (Allman and Falter, 2015). The extensive range of existing timing processes and methodologies, research paradigms and samples used in time-based studies with autism populations have, for their part, contributed to the fact that no general agreement exists on if and how the timing mechanisms might be altered in autism (Casassus, Poliakoff, Gowen, Poole & Jones, 2019).

Allman and Falter (2015) present three general trends in the research on abnormal timing and time perception in ASD. Firstly, studies concentrating on the sub-second range have tended to find superior temporal discrimination differences in people with ASD. Secondly, studies in the supra-second range have tended to find impairments in longer durations beyond the limits of the 'psychological present' of about 3 seconds as described by William James (1890) and connected with increased variability. Thirdly, there is initial evidence indicating problems with conceptual notions of time in ASD (Allman & Falter, 2015). According to Lorna Wing [as cited in Boucher, 2001, p. 88], autistic people seem to have a basic inability to make sense of past and present experiences, which has to do with comprehending the passage of time and linking it with

ongoing activities. This is backed up by clinical observations of people with AS displaying difficulties in estimating periods of time (Casassus et al., 2019; Zukauskas, Assumpcao & Silton, 2009).

Szelag, Kowalska, Galkowski and Pöppel (2004) studied if children with autism have typical temporal processing when it comes to the time domain of a few seconds. The results implicated an inability to link responses to stimulus duration. When exposed to auditory or visual stimuli, ASD children exhibited an average response duration of 3 seconds. Stimulus duration made no difference to the response duration. These findings can indicate that there are important deficits in judgment of duration in individuals with autism. The limited sample size (n=7) must be taken into consideration, and research with more data would be needed to confirm the findings.

In a study by Maister and Plaisted-Grant (2011) visual stimulation was presented to participants on a computer screen. After a one second wait, the participants were asked to reproduce the temporal duration. Altogether seven durations were tested (0.5, 1, 2, 4, 10, 30 and 45 seconds). Individuals with ASD had difficulties in reproducing long (45 seconds) and short durations (0.5-2 seconds). In a study by Wallace and Happé (2007) individuals with ASD were found to have intact time estimation, time production and time reproduction. In the time estimation task, participants were asked to estimate how much time had passed between the verbal cues of “go and stop”. In the time production task the participants were asked to say ‘‘go’’ and ‘‘stop’’ when the participants thought that a specific time sequence had passed. In the time reproduction task the participants were asked to imitate the passing of a time sequence created by the experimenter.

In a study addressing the role of movement timing irregularities in producing the motor deficits documented in AS, no central timing difficulties were observed, but the group with AS showed more irregularity in motor implementation (motor implementation delay is the delay between the central timer indicating appropriate time to respond, and the implementation of the movement Wing, 2002), compared to controls, and this irregularity correlated with general motor skills (Price, Edgell and Kerns 2012). In a study about behavioral aspects of cerebellar function in adults with AS, Gowen & Miall (2005) found that in comparison to control subjects, subjects with AS displayed decreased timing accuracy and decreased pointing accuracy and rate as well as increased postural instability. This might be consistent with cerebellar dysfunction found in AS and reflect impaired ability to integrate sensory input with appropriate motor commands. Subjects with AS also tended to judge the inter-stimulus interval as shorter, respond earlier and be more variable in their responses. The fact that the responses of subjects with AS did not, unlike the controls, vary between the synchronization and continuation tasks could indicate a fixed and non-adjustable mechanism of timing control.

Allman & Falter (2015) name four theories of the neurophysiological mechanisms underlying ASD. The first assumes an under-connectivity between long-distance cortical regions and over connectivity within regions, leading individuals with ASD to become overly concerned with local-level features and sometimes also leading to reduced processing of global-level events, a weak central coherence (e.g. Frith, 2004; Happe and Frith, 2006, for critical review on this theory see e.g. Vasa, Mostofsky & Ewen, 2016). The second theory leans on pathophysiological differences in executive function and the third theory concerns ASD as a condition, where theory of mind skills (referring to the cognitive capacity of attributing mental states to self and others, Goldman, 2013) are impaired. The fourth theory, still in a

developmental stage due to the limited research on the subject, could be defined around the anecdotal, clinical and behavioral observations of impairments in the development of timing and time perception in ASD.

1.4. Aims of the Study

The aim of the study was to find out if there are differences between how parents of the three groups (ADHD, ASD and typically developing children) rate their children's sense of time with the It's About Time, Parent Form -Revisited (IAT-PF-R) -questionnaire, created by Russell A. Barkley (1998). Parental reports are often used in clinical settings, as a part of the diagnostic approach. Arguably, parents are able to observe their children in numerous settings and over a long period of time (Meaux & Chelonis 2005). Consequently, the information received from parents can be assumed to be more reliable than self-reports of children. According to previous research, ADHD and ASD children have been identified to have an impaired sense of time. The results have mainly been obtained in laboratory settings. Less focus has been put on how these problems manifest themselves in everyday life (Houghton et al. 2011).

It is conceivable that the two diagnostic groups, while both dealing with time perception challenges, differ in how these difficulties are present in their everyday lives. We hypothesize that (a) children with ADHD or ASD will display more difficulties with time perception than the typically developing children, and (b) that children with ADHD will display more difficulties in time perception than children with ASD. Thus, we investigate whether it is possible to identify differences between the two diagnostic groups and the control group based on parental answers to the IAT-PF-R questionnaire.

Our research question is formulated as follows:

(i) Are there differences between children with ADHD or ASD and typically developing children with regard to parent-reported time perception?

2. Material and Method

2.1. Participants

The sample, consisting of children diagnosed with either ADHD (F90.0) or ASD children diagnosed with Asperger Syndrome (F84.5), was collected from an electronic health record located at the Turku University Hospital (TYKS), between the years 2017 and 2019. Exclusion criteria for participation were other comorbid neurological or psychiatric diagnoses, vision or hearing impairments and physical disabilities. Other exclusion criteria were the use of atomoxetine and a full-scale intelligence quotient below 70. Children not living with their biological parent/parents were excluded from the study, since participation required knowledge of the whole developmental history of the child. The control group was recruited during the same years through teachers, psychologists and researchers. The exclusion criteria for the controls were as mentioned above and an absence of a neurological or psychiatric diagnosis. A written request to participate in the study was sent to children and their families who met the inclusion criteria. The Ethics Committee of the Hospital District of Southwest Finland approved the research protocol and the research procedure was executed in unison with the latest version of the Declaration of Helsinki.

Altogether 116 requests to participate in the study were posted in 2017 (Isaksson, 2018; Saario, 2018.) In 2019, another 150 requests were posted to children diagnosed with ADHD. 16 people replied to the invitation in 2017 and 14 of them matched the criteria and were accepted to

the study. In the year 2019, 17 people replied to the request and 13 of them participated in the study. Two children in the 2019 sample were recruited through the researchers. The medication for the group with ADHD was discontinued for 24 hours prior to the study. Medication has been found to have a normalizing effect on the time perception (Barkley 2001). An overall intellectual ability was assessed for all of the participants with the Wechsler Intelligence Scale for Children, WISC-IV.

The final sample consisted of 67 Finnish children: 56 boys and 11 girls, aged between 8 and 14 years (M = 10.6, SD= 1.85, mdn = 10.33). The sample was divided into three different groups; (i) those with attention-deficit/hyperactivity disorder (F90.0), (ii) ASD children diagnosed with Asperger Syndrome (F84.5) and (iii) a group of typically developing children, TDC (see Table 1 for age, sex, and FSIQ points for the participants).

Table 1
Descriptive statistics for the sample

Diagnosis	Male (/%)	Mean age	Median age	SD	Mean FSIQ	SD FSIQ
ADHD	83	10.73	10.73	1.66	87.00	17.10
ASD	88	10.66	10.33	3.34	101.60	18.33
TDC	81	10.52	10.33	1.58	107.80	10.50

For the group with ASD children diagnosed with Asperger syndrome The Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2000) and the Social Communication questionnaire (SCQ) (Rutter et al., 2003) were used to confirm the diagnosis. To confirm the diagnosis in the group of children with ADHD, teachers and parents were asked to fill in the ADHD rating scale IV (DuPaul, Power, Anastopoulos, & Reid, 1998).

2.2. It's About Time, Parent Form -Revisited (IAT-PF-R) -Questionnaire

The sense and management of time was measured with Barkley's IAT-PF-R – questionnaire. The questionnaire has been used in previous research to measure the sense of time in children with ADHD (Barkley et al, 1997; Quartier et al. 2010; Saario, 2018) and in children with ASD (Allman et al. 2011; Isaksson et al. 2018; Meaux & Chelonis, 2005). This study utilized a translated version of the IAT-PF-R (Torsti, Pihlakoski & Markkula, 2010, see appendix). The questionnaire has 25 items with scoring as follows: rarely (0), sometimes (1), most of the time (2), and almost always (3). Lower scores on the questionnaire imply higher difficulties in time perception. The parents for the group with ADHD were instructed to answer the questions based on how their children behaved before starting a medication or while having a break from the medication. Altogether 65 IAT-PF-R -questionnaires were handed in. Two questionnaires were missing from the data. The IAT-PF-R scores were used to compare the three groups in order to see if they differed from each other.

Table 2

IAT-PF-R Mean Score, Standard Deviation and Variance for the Three Groups

	Mean	SD	Variance
ADHD (n=28)	31.42	10.25	105.14
ASD (n=17)	30.24	11.35	128.94
TDC (n=20)	49.05	8.83	77.94

2.3. Statistical Analyses

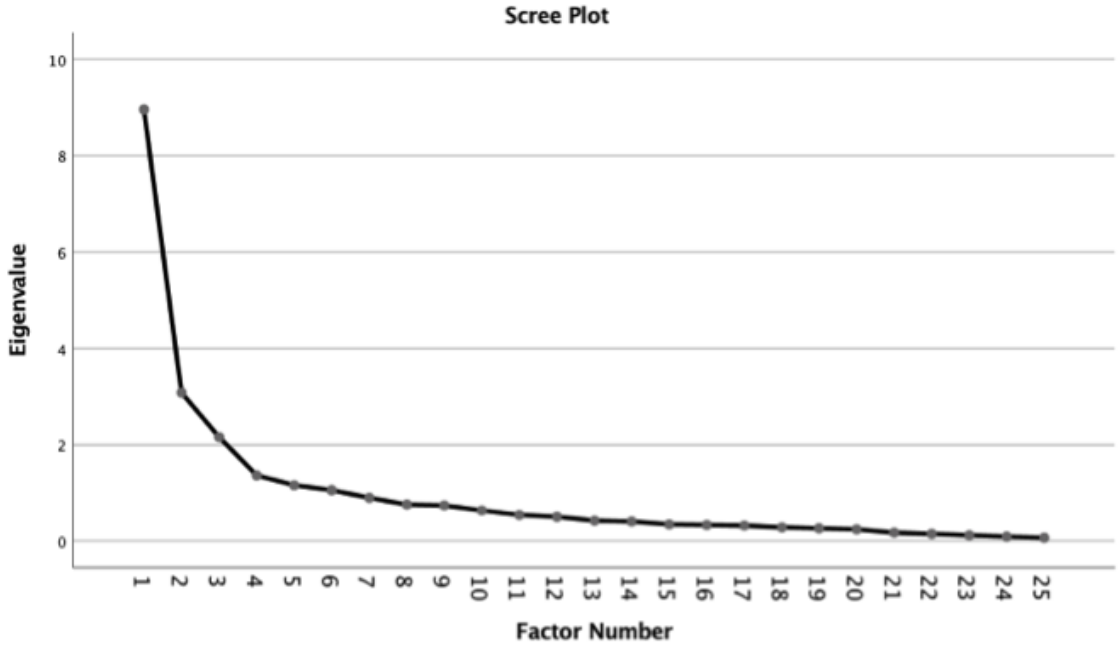
Statistical analyses were performed using IBM SPSS, version 24. A Factor analysis with varimax rotation was carried out on the 25 items of the IAT-PF-R questionnaire to assess the factorial structure. Composite factor scores for each of the three factors were calculated for the respondents, in order to compare the groups. We used factor analysis to investigate relationships

between the variables in order to understand underlying, latent concepts. This is useful when working with complex phenomena not easily captured by individual variables.

3. Results

A factor analysis with varimax rotation allowed us to extract altogether three factors, explaining 58% of the variance (see figure 1 for the scree plot obtained).

Figure 1
The Scree Plot



Of the 25 questions, 14 were deleted because of unsatisfactory variable loadings (see appendix). This procedure left us with 11 questions. We used the approach suggested by Howard (2016) in which it is required that a) variables load on to their primary factor above 0.40, b) that they do not load onto alternative factors above 0.30 and c) there is a difference of at least 0.20 between the primary and any alternative factor loadings. Factor one (explaining 21% of variance) describes *temporal perspective*, which means the ability to comprehend past, present and future events (Isaksson et al. 2018). Factor two (explaining 20% of the variance) refers to *impulsivity,*

meaning that future consequences are not taken into account in decision making in the moment. Factor three (explaining 17% of the variance) is related to the child's *ability to plan forward,* for example when this is required by school tasks. The Cronbach's alpha for Factor 1 (four items) was α=.821, the Cronbach's alpha for Factor 2 (three items) was α=.879 and the Cronbach's alpha for Factor 3 (four items) was α=.722.

Factor scores were used to compare children within the diagnostic groups (ADHD and AS) to typically developing children. There were no significant differences between the groups on the Factor 1 (temporal perspective), F (2, 61) =.041, p=0.960. Post Hoc test revealed that the groups with AS and ADHD differ significantly from the group with typically developing children on Factor 2 (impulsivity), F (2, 61) = 12.635, p=.000, η2 =.36 while no significant difference was found between the groups with AS and ADHD. On Factor 3 (ability to plan forward), the group with ADHD differs significantly from the typically developing children, F (2, 61) = 10.421, p=.000, η2 =.25. The effect size was large. This finding indicates that ADHD subjects seem to experience more difficulties with forward planning of their everyday activities than the typically developing children. The difference between the groups with AS and ADHD on Factor 3 was in line with the hypothesis, however, the result was not significant, p=.053.

4. Discussion

The study investigated whether there are differences between ADHD, AS and typically developing children with regard to parent-reported time perception instrument (IAT-PF-R - Questionnaire, Barkley, 1998; translated into Finnish by Torsti, Pihlakoski & Markkula, 2010). An abnormal sense of time has been linked to several developmental disorders such as ASD (Allman and Falter, 2015; Falter and Noreika, 2011, 2014), and ADHD (Coghill, Toplak, Rhodes & Adamo, 2018; Ptacek et al. 2019). Previous research has mainly concentrated on measuring

time perception in children with time production, reproduction and estimation tasks in laboratory settings. Less attention has been paid to how parents observe their children's sense of time in everyday life.

In earlier research, Quartier et al. (2010) were able to extract four factors from the parent-report measure. Factor 1 (explaining 17.8% of variance) is related to meeting deadlines of work assignments and parental instruction, Factor 2 (explaining 16.9% of variance) refers to forward planning and anticipation abilities, Factor 3 (explaining 12.7% of variance) describes children's referring to the past or to the future in their daily discourse with others, and Factor 4 (explaining 8.7% of variance) refers to impulsivity. Unlike Quartier et al. (2010), we were able to find only three factors in this study, (i) temporal perspective, (ii) impulsivity and (iii) ability to plan forward. Our results failed to confirm a difference between the groups in their ability to comprehend past, present and future events. This result could have been affected by the fact that we ended up extracting quite many questions from the IAT-PF-R, following the approach suggested by Howard (2016).

Our study showed that the two groups (ADHD and ASD) differ significantly from the typically developing children in their ability to take future consequences into account in the decision making in the moment. This is not surprising, since impulsivity is listed in DSM-5 as one of the core symptoms of ADHD. Impulsivity in ADHD children has also been confirmed by numerous studies (Patros et al., 2016; Miller, Derefinko, Lynam, Milich & Fillmore, 2010). Impulsivity is also one of the symptom characteristics of ASD, a fact that is supported by several research findings. (Matson, Mahan, Hess, & Fodstad, 2010 & Semrud-Clikeman, Walkowiak, Wilkinson & Butcher 2010).

In our study, we found that ADHD children differed significantly from the typically developing children in their ability to plan forward. This finding was in line with the results from Quartier et al. (2010). Also in another study comparing the prospective memory performance of children with ADHD and controls, the results implicated that children with ADHD may demonstrate problems forming delayed intentions (indicated by impulsive planning). This, in its turn, may have further significance for the retention and implementation of these delayed intentions. (Kliegel, Ropeter & Mackinlay, 2006)

As for the group with AS, there was no significant difference in the ability to plan forward compared to the typically developing children. In this regard our results differ from findings in a study done by Semrud-Clikeman, Walkowiak, Wilkinson and Butcher (2010) comparing neuropsychological and behavioral rating measures of executive functions (EF) in children with two subtypes of ADHD, Asperger syndrome (AS), and controls. According to their results, children in the group with AS showed difficulties in planning forward compared to the groups with ADHD. It is, however, worthwhile to mention that the difference between the groups with AS and ADHD was close to significant. Further research is needed to investigate whether ADHD and ASD children differ in their ability to plan forward.

The finding that both children with AS and ADHD were significantly different from the typically developing children in understanding the consequences in decision-making is backed up by previous research. In a study by Luman, Oosterlaan, Knoland and Sergeant (2008), focusing on decision-making and reinforcement sensitivity in children with ADHD and controls using a gambling paradigm the research findings suggest that during decision-making, children with ADHD may be sensitive to the frequency but blind to the magnitude of penalty.

The study has some limitations that should be taken into consideration when interpreting the results. Firstly, the sample size was relatively small and consisted only of Finnish children, so replicating the study with a larger and more heterogeneous sample could make the results more generalizable. Secondly, the study may have been affected by voluntary response bias, as participating in the study has been a voluntary decision made by parents and their children. It is possible that this may have influenced the selection of participants, for example by excluding participation of children whose families are more burdened in everyday life by the diagnosis, as participation requires some extra arrangements in addition to the everyday challenges. Thirdly, a translated version of the IAT-PF-R was used. Translating an instrument causes the risk of various sources of bias (Van de Vijver & Hambleton, 1996). Leeuw, Hox & Dillman (2012) argue that all translated questions are adapted questions. A direct translation may change the content of the question. There might also have been a disparity in how parents have interpreted the questions in the instrument. This, however, is a common problem in the same type of studies. Lastly, there is a genetic basis for both ADHD and ASD. It is possible that some of the parents answering the IAT-PF-R-questionnaire might suffer from the same kind of time perception problems as their children (Houghton et al., 2011).

Although the amount of research focusing on temporal issues in both ADHD and ASD is currently growing, many questions are still unanswered. Most studies have been conducted in strict laboratory conditions. There is a need to further explore how children with ADHD and ASD perceive time in everyday settings and how possible deficits in time perception manifest themselves in a natural context. Taken together, our research extends earlier work by comparing three groups: ADHD, ASD and typically developing children with a parent- report measure. Replicating the current study with a larger sample could give further insight into identifying

differences between the two diagnostic groups and the typically developing children. The time deficits found in these groups might in the future be used for diagnostic purposes as well as in the management of the symptoms.

SVENSK SAMMANFATTNING – SWEDISH SUMMARY

It's About Time -

Tidsuppfattning och tidshantering hos barn med ADHD och ASD

Inledning

En väsentlig del av forskningen om tid inom psykologi är studier som fokuserar på skillnader i temporal bearbetning samt deras psykologiska konsekvenser hos olika kliniska populationer (Vatakis & Allman, 2015). Också denna studie om tidsuppfattningen hos barn med hyperaktivitetssyndrom med uppmärksamhetsstörning (ADHD) och barn inom autismspektrum, diagnosticerade med Aspergers syndrom (AS) faller inom detta forskningsområde.

Hyperaktivitetssyndrom med uppmärksamhetsstörning (ADHD)

ADHD delas in i en ouppmärksam, en impulsiv/hyperaktiv och en kombinerad form, där det finns symtom tillhörande båda formerna (Barkley, 2015). Kriterier i DSM-5 är minst sex symtom (för äldre tonåringar och för 17 åriga samt för äldre minst fem symtom) som måste ha utvecklats före 12-årsåldern, varat i minst 6 månader till en grad som är oförenlig med utvecklingsnivån och som stör eller försämrar funktionsförmågan socialt, i studier eller i arbete (i minst två miljöer) (APA, 2013). Prevalensen av ADHD är cirka 5,0 % hos barnen och 2,5 % hos vuxna (APA, 2013). Flera män än kvinnor uppvisar symtom på ADHD (Polanczyk et al., 2007). I Finland var prevalensen hos 8-åringar 7 % år 1989 (Almqvist et al., 1999) och bland 16–18-åringar i norra Finland 8,5 % år 1986 (Smalley et al., 2007).

Autismspektrumstörning (Autism Spectrum Disorder, ASD)

Den andra gruppen i denna studie består av barn inom autismspektrum, diagnostiserad med Aspergers syndrom (AS) F84.5 (World Health Organization, WHO, 2016). Liksom autism, innebär även AS kvalitativa brister i ömsesidig social interaktion samt begränsade och repetitiva beteendemönster, intressen och aktiviteter, men det finns ingen försening i språk eller kognitiv utveckling vilket observeras i autism (WHO, 2016). Såväl autism som AS fortsätter till vuxen ålder, men autism är vanligtvis tydlig före 3-årsåldern, medan AS ofta upptäcks först i förskoleåldern (Khouzam, El-Gabalawi, Pirwani & Priest 2004). Diagnosen av autism och AS håller på att förändras när ICD-10 ersätts av ICD-11-klassificeringen år 2022 och de enskilda diagnoserna av autism, AS, atypisk autism och desintegrativ störning ersätts av en paraplydiagnos "autismspektrumstörning" (Autismiliitto). Det finns få epidemiologiska studier av AS, men prevalensen estimeras vara cirka 2,5/10 000 (Fombonne, 2003). Bland åttaåriga barn i Finland var det totala estimatet för prevalens av AS 4,3/1000 (Mattila et al., 2007).

Tidsuppfattning

Tidsuppfattningen är en kognitiv färdighet, som underlättar vår förmåga att förutsäga, förutse och svara effektivt på kommande händelser (Toplak, Rucklidge, Hetherington, John och Tannock, 2003). I en normal utveckling uppstår tidsuppfattningen tidigt i barndomen och den blir allt bättre med åldern (Droit-Volet, 2013). Olika delområden i hjärnan har identifierats vara involverade i olika tidsfunktioner (Rubia och Smith, 2004). I forskningen har tidsuppfattningen oftast mäts med egenskaper bestående av uppskattning, diskriminering, produktion och reproduktion av tid (Quartier, Zimmerman & Nashat, 2010).

Timing uppfattas som förmågan att styra ett beteende i en temporal domän av specifika tidsramar, att uppfatta och uppskatta tidsintervaller och att bedöma framtida konsekvenser av beteendet (Noreika, Falter & Rubia, 2013). Timing indelas ofta i motorisk timing (att organisera ett motoriskt beteende i en exakt tidsram), perceptuell timing (förmågan att uppskatta längden av ett temporalt intervall) och ett temporalt perspektiv (färdigheten att beakta tidigare, nuvarande och framtida händelser i en planering) (Noreika et al. 2013). Två viktiga begrepp i forskningen om timing är tidsintervaller som är i) kortare än en sekund (*sub-second*) och ii) längre än en sekund (*supra-second*). Forskningen indikerar att olika neurala system används för att mäta dessa intervaller (Lewis & Miall, 2003) och att de också har olika uppgifter: intervaller kortare än en sekund är kopplade till motorisk kontroll samt talproduktion och längre än en sekund till sökande efter föda, beslutsfattande och mental uppskattning av tiden (Buhusi & Meck, 2005; Hore, Wild & Diener, 1991). Intervaller kortare än en sekund hanteras relativt automatiskt medan intervaller på över en sekund kräver mer kognitiv kontroll (Wiener, Turkeltaub & Coslett, 2010).

Tidsuppfattning hos barn med ADHD och barn med AS

De primära diagnostiska egenskaperna hos barn med ADHD, ouppmärksamhet, impulsivitet och hyperaktivitet, åtföljs ofta av sekundära brister i tidsfunktioner (Noreika et al., 2013). Svårigheterna i tidsdiskriminering hos barn med ADHD har studerats rätt mycket (Barkley, Koplowitz, Anderson & McMurray, 1997; Smith, Taylor, Rogers, Newman & Rubia, 2002). Barn med ADHD har brister bland annat med att genomföra uppgifter som mäter tidsproduktion, tidsreproduktion och motorisk timing (Toplak, Dockstader & Tannock, 2006; Smith et al., 2002).

Den knappa forskning som gjorts om tidsuppfattningen hos individer med ASD indikerar tydligt om en onormal bearbetning av tiden, men bevisen är tillsvidare rätt svaga och resultaten varierande. I studier som gällt tidsintervaller på kortare än en sekund, har man hittat signifikanta temporala diskriminerande differenser hos individer med ASD och i studier av tidsintervaller längre än en sekund, har man hittat störningar i tidsperioder som går utöver gränsen på cirka 3 sekunder, och i forskning har det också hittats bevis som tyder på problem med begreppsmässiga uppfattningar om tid (Allman & Falter, 2015).

Det finns flera teorier om de neurofysiologiska mekanismer som ligger bakom ASD. En av hypoteserna antar att det finns en underaktiv koppling mellan de långdistans-kortikala regionerna och en överaktiv koppling inom regionerna, en annan bygger på patofysiologiska skillnader i målstyrt beteende, en tredje antar att det brister i ”theory of mind-skills” (den kognitiva förmågan att tillskriva mentala tillstånd till sig själv och andra, Goldman, 2013) och en fjärde hypotes utvecklar anekdotiska, kliniska samt beteendeobservationer av funktionella brister i utvecklingen av tidsuppfattningen och att hålla tider (Allman & Falter, 2015).

Avhandlingens syfte

Syftet med denna avhandling är att undersöka om det finns skillnader mellan barn med ADHD, ASD och barn i en kontrollgrupp i fråga om föräldrarapporterad tidsuppfattning. Vi undersöker således om det är möjligt att identifiera skillnader i problem med tidsuppfattning mellan de två diagnostiska grupperna och kontrollgruppen utgående från föräldrarnas åsikter om barnets tidsuppfattning.

Material och metod

Deltagare

Samplet består av barn diagnostiserade med ADHD (F90.0) och barn inom autismspektrum, diagnostiserade med Aspergers syndrom (F84.5) och samlades in från en elektronisk hälsojournal vid Åbo universitetscentralsjukhus (ÅUCS) under åren 2017-2019; kontrollgruppen rekryterades under samma år av lärare, psykologer och forskare. Medicineringen för gruppen med ADHD avbröts för en tid på 24 timmar före genomförandet av studien. En övergripande intellektuell förmåga utvärderades för alla deltagare med Wechsler Intelligence Scale for Children, WISC-V. The Autism Diagnostic Observation Schedule (ADOS) och frågeformuläret för social kommunikation (SCQ) användes för att bekräfta diagnosen på Aspergers syndromet.

Det slutliga samplet (se tabell 1) bestod av 67 finskspråkiga barn i åldern 8-14, varav 56 var pojkar och 11 flickor. Mätningarna för 2 deltagare saknas. Gruppen med ADHD bestod av 29 barn: 24 pojkar och 5 flickor, med en medelålder på 10,73 (median = 10,25 Sd = 1,65). Gruppen med autismspektrumstörning (Aspergers syndrom) bestod av 17 barn: 15 pojkar och 2 flickor, med en medelålder på 10,96 (median = 11, Sd = 2,35). Kontrollgruppen bestod av 20 normalt utvecklade barn som deltog som frivilliga, varav 17 var pojkar och 4 flickor med en medelålder på 10,17 år (median = 10,1, Sd = 1,65).

Mätinstrument

För att mäta tidsuppfattningen hos försökspersonerna användes frågeformuläret It's About Time - Parent Form - Revisited (IAT-PF- R, Russell A. Barkley, 1998), som består av 25 frågor/påstående och mäter tidsuppfattning och organisation på en skala från noll till tre: sällan

(0), ibland (1), oftast (2) och nästan alltid (3). Lägre poäng innebär högre svårigheter i tidsuppfattningen. Barkleys frågeformulär har använts i tidigare forskning för att bedöma tidskänslan hos barn med ADHD (Barkley et al, 1997; Quartier et al. 2010; Saario, 2018) och hos barn med ASD (Allman et al. 2011; Isaksson et al., 2018; Meaux & Chelonis, 2005). Barnens föräldrar ombads att fylla i en översatt, finskspråkig version av IATR-PF-R (Torsti, Pihlakoski & Markkula, 2010, se bilaga) och svara på frågorna baserat på hur deras barn uppförde sig antingen innan de startade medicineringen eller hade en paus från medicineringen. Totalt lämnades 65 IAT-PF-R-frågeformulär in.

Statistiska analyser

I vår analys använde vi faktoranalys med varimaxrotation. Av de ursprungliga 25 variablerna extraherades tre faktorer som totalt förklarar 58 % av variansen. Faktor ett förklarar 21 % av variansen och beskriver det temporala perspektivet, dvs. förmågan att förstå tidigare, nuvarande och framtida händelser (Isaksson et al. 2018). Faktor två förklarar 20 % av variansen och hänvisar till impulsivitet, dvs. tendensen att inte beakta framtida konsekvenser i beslutsfattande. Faktor tre förklarar 17 % av variansen och är relaterad till barnets förmåga att planera framåt.

Resultat och diskussion

Vi fann att barnen med ADHD och AS skilde sig väsentligt från kontrollgruppen i förmågan att ta hänsyn till framtida konsekvenser av beslutsfattande i nuet. Detta är inte förvånande eftersom impulsivitet är ett kärnsymtom för ADHD (Patros et al., 2016; Miller,

Derefinko, Lynam, Milich & Fillmore, 2010) och hos individer med ASD (Matson, Mahan, Hess & Fodstad, 2010 & Semrud-Clikeman, Walkowiak, Wilkinson & Butcher 2010).

Vi fann också att barn med ADHD skiljer sig väsentligt från kontrollgruppen i förmågan att planera framåt i tiden. Detta också i linje med resultaten från Quartier et al.(2010). Vi fann att både barn med AS och ADHD skiljer sig väsentligt från kontrollgruppen när det gäller att förstå konsekvenserna av beslut. Detta stöds av tidigare forskning. (Luman, Oosterlaan, Knoland & Sergeant, 2008).

Vi fann att till skillnad från gruppen med ADHD fanns det inga signifikanta skillnader mellan gruppen med AS och kontrollgruppen när det gäller förmågan att planera framåt i tiden. Vårt resultat skiljer sig markant från Semrud-Clikeman, Walkowiak, Wilkinson och Butchers (2010) resultat som jämförde neuropsykologiska och beteendemässiga studier av målstyrd aktivitet hos barn med två undertyper av ADHD och Aspergers syndrom (AS). Deras resultat visade att barn i gruppen med AS hade mest svårigheter med planeringen jämfört med gruppen med ADHD. Vi kan ytterligare konstatera att i vår undersökning var skillnaden mellan grupper med ASD och ADHD nästan signifikant.

Vår studie har några begränsningar. Samplet var relativt litet och bestod endast av frivilligt deltagande finska barn, men å andra sidan var den unikt och kan utökas till en större databas i framtiden. Det finns risker med att använda en översatt version av ett mätinstrument (Van de Vijver & Hambleton, 1996), i vårt fall IAT-PF-R eftersom vissa koncept kan få en något annorlunda betydelse på finska och det kan också uppstå skillnader i hur föräldrarna tolkat frågorna i frågeformuläret.

Forskning med fokus på temporala problem vid ADHD och ASD håller på att intensifieras, men det finns många obesvarade frågor och oanvända möjligheter för att utnyttja forskningsresultaten för att utveckla stödåtgärder för barn med ADHD eller ASD och deras föräldrar i syfte att bättre hantera olika utmaningar med tiden i vardagen. Vår studie bidrar till att utvidga och presentera nya resultat om temporala problem vid ADHD och ASD. Att replikera vår studie med ett större sampel ytterligare kunde hjälpa att identifiera skillnader mellan de två diagnostiska grupperna och kontrollgruppen.

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Appendix

IAT-PF-R Ajan hahmottamisen asteikko

Questions removed from the analyze: 1, 2, 4, 7, 8, 11, 12, 17, 20, 21, 22, 23, 24, 25

IAT-PF-R
Ajan hahmottamisen asteikko

It's About Time, Parent Form - Revised
© Russell A. Barkley, Ph.D. 2/17/98
(Suomenkielinen käännös: Jutta Torsti, Leena Pihlakoski ja Juha Markkula, 2010)

Vastausohje: Tämä kysely pyrkii kartoittamaan kuinka hyvin lapsenne kykenee toiminnassaan hahmottamaan ja huomioimaan ajan kulun sekä kuinka usein hän puhuu ajasta tai vaikuttaa ajattelevan sitä.
Ole hyvä ja lue alla olevat kysymykset ja merkitse ympyröimällä kunkin kysymyksen kohdalla se vaihtoehto, joka mielestäsi parhaiten sopii kuvaamaan lastasi. Jos lapsellanne on tällä hetkellä käytössä jokin tunne-elämän tai käytöksen ongelmiin tarkoitettu lääke, pyri vastaamaan kysymyksiin sen perusteella, millainen lapsesi on tai olisi silloin kun hän EI VIELÄ KÄYTTÄNYT TÄTÄ LÄÄKETTÄ tai hänellä on TAUKO tästä lääkityksestä.

1	Kuinka usein voit olettaa lapsesi saavan määräajassa valmiiksi jonkin hänelle antamasi tehtävän?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
2	Miten usein lapsesi puhuu aikaisemmin tekemistään asioista, jos häntä vertaa muihin samanikäisiin lapsiin?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
3	Miten usein lapsesi tekee mennyttä aikaa koskevia kysymyksiä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
4	Miten usein lapsesi puhuu itseään koskevista tulevista tapahtumista?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
5	Miten usein lapsesi kysyy sinulta tulevista tapahtumista?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
6	Miten usein lapsesi käyttää kelloa selvittääkseen kuinka kauan hänellä on vielä aikaa tehdä jotakin?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
7	Miten usein lapsesi suunnittelee tai sopii muiden kanssa tekevänsä jotakin jonkin ajan päästä tai tulevaisuudessa?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
8	Jos lapsellasi on jossain tehtävässä määräaika, miten usein voit olettaa hänen olevan valmiina määräaikaan mennessä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
9	Miten usein lapsesi illalla sängyssä puhuu kuluneen päivän tapahtumista tai vaikuttaa miettivän niitä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
10	Miten usein lapsesi nukkumaanmenoaikaan puhuu seuraavan päivän tekemisistään tai vaikuttaa miettivän niitä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
11	Miten usein lapsesi on vaikea odottaa jonkin aikaa lupaa tehdä jotain, mitä hän haluaisi tehdä juuri nyt?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
12	Miten usein lapsesi näyttää ottavan huomioon aiemmat kokemuksensa (esimerkiksi vastaavasta tilanteesta), ennen kuin hän toimii?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina

(KYSELY JATKUU SEURAAVALLA SIVULLA…)

13	Miten usein lapsesi näyttää ennakoivan asioita ennen kuin toimii jossakin tilanteessa?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
14	Verrattuna muihin samanikäisiin miten usein lapsesi vaikuttaa etukäteen suunnittelevan asioita, joita haluaisi tehdä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
15	Lapsellasi on koulusta laaja kotitehtävä, kuten kirja-arvostelu tai esitelmä jonka pitää olla valmis muutaman viikon päästä. Kuinka kauan ennen tuota määräaikaa voit olettaa hänen aloittavan työn tekemisen?	5 Aloittaa saman tien 4 Odottaa kunnes aikaa on jäljellä enää viikko 3 Odottaa kunnes aikaa on jäljellä enää muutama päivä 2 Odottaa kunnes aikaa on jäljellä enää päivä 1 Odottaa määräpäivään ja aloittaa valmistautumisen vasta aivan viime tingassa (tunteja ennen) 0 Ei valmistaudu tehtävään ollenkaan
16	Miten usein lapsesi tekee kotitehtävänsä ajoissa?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
17	Miten usein lapsesi on aamuisin ajoissa valmiina lähtemään kouluun?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
18	Miten usein lapsesi harkitsee, mitä seurauksia hänen teoistaan voi olla hänelle itselleen?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
19	Miten usein lapsesi harkitsee, mitä seurauksia hänen teoistaan voi olla muille?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
20	Miten usein lapsesi vaikuttaa saavan työnsä valmiiksi siihen varatussa ajassa?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
21	Kun lapsesi lähtee kotoa esimerkiksi ulos leikkimään, kuinka usein hän palaa sovittuun kotiintuloaikaan mennessä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
22	Kuinka usein lapsesi viivyttelee tehtävien tekemisessä?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
23	Jos lapsesi lupaa tekevänsä jotakin myöhemmin samana päivänä, kuinka usein oletat hänen tekevän sen muistuttamatta?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
24	Kuinka usein voit olettaa lapsesi tekevän jotakin heti, jos lupaat hänen saavan siitä palkkion selvästi myöhemmin?	0 Harvoin 1 Joskus 2 Useimmiten 3 Lähes aina
25	Miten hyvin lapsesi ajantaju kaiken kaikkiaan on kehittynyt muihin samanikäisiin verrattuna?	0 Heikosti 1 Keskivertoa heikommin 2 Keskivertaisesti 3 Keskivertoa paremmin 4 Paljon keskivertoa paremmin

KIITOS VASTAUKSISTASI! Tarkistatan vielä että olet muistanut vastata jokaiseen kohtaan!