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Disability and Health Journal 2 (2009) 15–19

Disability and Health Journal

www.disabilityandhealthjnl.com

# Measurement of time processing ability and daily time management in children with disabilities

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## Abstract

**Background:** Improvement is needed in methods for planning and evaluating interventions designed to facilitate daily time management for children with intellectual disability, Asperger syndrome, or other developmental disorders.

**Objectives:** The aim of this study was to empirically investigate the hypothesized relation between children's time processing ability (TPA), daily time management, and self-rated autonomy. Such a relationship between daily time management and TPA may support the idea that TPA is important for daily time management and that children with difficulties in TPA might benefit from intervention aimed at improving daily time management.

**Methods:** Participants were children aged 6 to 11 years with dysfunctions such as attention-deficit/hyperactivity disorder, autism, or physical or intellectual disabilities ($N = 118$). TPA was measured with the instrument KaTid. All data were transformed to interval measures using applications of Rasch models and then further analysed with correlation and regression analysis.

**Results:** The results demonstrate a moderate significant relation between the parents' ratings of daily time management and TPA of the children, and between the self-rating of autonomy and TPA. There was also a significant relation between self-ratings of autonomy and the parents' rating of the children's daily time management. Parents' ratings of their children's daily time management explain 25% of the variation in TPA, age of the children explains 22%, while the child's self-rating of autonomy can explain 9% of the variation in TPA. The three variables together explain 38% of the variation in TPA. The results indicate the viability of the instrument for assessing TPA also in children with disabilities and that the ability measured by KaTid is relevant for daily time management.

**Conclusions:** TPA seems to be a factor for children's daily time management that needs to be taken into consideration when planning and evaluating interventions designed to facilitate everyday functioning for children with cognitive impairments. The findings add to the increasing knowledge base about children with time processing difficulties and contribute to better methods aimed at improving these children's daily time management. Further research is needed to examine if there are differences in TPA related to specific diagnosis or other child characteristics. 

*Keywords:* Child; Time perception; Time orientation; Rasch analysis

There is a need for improvement in the clinical methods for planning and evaluating interventions designed to facilitate time management (TM) in daily life for children with intellectual disability (ID), autism spectrum disorders (ASDs), or other developmental disorders [1-3]. In this paper, TM in daily life (daily TM) is the child's performance or behavior concerning TM in everyday situations as perceived by parents. Assessment of daily TM of children usually requires that information is collected from parents or other caregivers. In a study of typically developing (TD) children, parental ratings were used for assessing daily TM, with the result revealing a moderate statistical relation between parental ratings of TD, children's daily TM, and time processing ability (TPA) [1]. TPA includes time perception, time orientation, and TM, all defined *in International Classification of Functioning, Disability and Health (ICF)* [4]. Time perception is the mental functions related to the subjective experiences of the length and passage of time, time orientation is awareness of the day, date, month, and year, and TM is the mental function of ordering events in a chronological sequence and allocating amounts of time to events and activities [4]. A combination of items aimed at measuring aspects of time perception, time orientation and TM, can support measuring a unidimensional construct, TPA [1].

Systematic measurement of TPA in children would increase knowledge in this area. The KaTid [Swedish: Kit

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doi:10.1016/j.dhjo.2008.09.002

for Assessing Time Processing Ability] is a new instrument developed for this purpose [1]. If an instrument is to be clinically useful in evaluating the potential effects of interventions, in this case a measure of TPA, it must be related to performance in daily TM [5]. In order to provide such evidence of validity, there is a need for further investigation of the relationship between TPA in children with disabilities, as measured with KaTid, and daily TM as reported by parents.

Self-rated *autonomy* is today considered to be one relevant marker of everyday functioning [6,7]. An autonomous person has the capability to take responsibility for decisions on matters concerning him/herself [8]. Time management in daily life can be considered as one aspect of autonomy. Self-rated autonomy is therefore examined in this paper. This study will investigate the relationship between TPA, daily TM, and self-rated autonomy in children with disabilities. The specific hypotheses are:

(a) There is a relationship between children's self-rating of autonomy and their TPA, as measured with KaTid.
(b) There is a relationship between parents' ratings of the child's daily TM and the child's TPA, as measured with KaTid.
(c) There is a relationship between the parents' ratings of the child's daily TM and the child's self-rating of autonomy.

## Methods

### *Participants*

The participants in this study were children who received outpatient services from paediatric habilitation centers all over Sweden, a convenience sample of children between 6 and 11 years of age with ADHD, ASD, mild or moderate ID, myelomeningocele (MMC) or cerebral palsy (CP) were included. Informed consent was obtained from parents and 118 children. The distributions of the participants' age and diagnosis are presented in Table 1.

Table 1
Description of Diagnosis Distributed on Age Expressed in Numbers ($N$ = 118)

| | Diagnosis | | | | | |
|---|---|---|---|---|---|---|
| Age (yr) | ADHD | ASD | ID | Physical disability | Double diagnosis | Total |
| 6 | 2 | 3 | 4 | 8 | 0 | 17 |
| 7 | 4 | 1 | 6 | 6 | 2 | 19 |
| 8 | 3 | 2 | 7 | 7 | 6 | 25 |
| 9 | 5 | 7 | 8 | 3 | 4 | 27 |
| 10 | 6 | 4 | 8 | 6 | 0 | 24 |
| 11 | 0 | 1 | 2 | 0 | 3 | 6 |
| Total | 20 | 18 | 35 | 30 | 15 | 118 |

ADHD, attention-deficit/hyperactivity disorder; ASD, autism spectrum disorder; ID, intellectual disability.

### *Outcome measures*

The children rated their autonomy in daily routines with the help of a short self-rating scale derived from a longer validated self-rating questionnaire measuring autonomy [9]. The Swedish full version for children aged 7 to 12 years has been used in several studies indicating a close connection between autonomy and participation [7,10]. The full version of this instrument would have been too time-consuming to administer, so the first author and a colleague constructed a short version, the *Self-rating Scale*. All seven items addressing autonomy in daily routines from the original scale were used, as activities in daily routines are less affected by emotions, etc. [11] (see Table 2, items 1–7). Also, five items in the original instrument categorized as interacting with people, participation, or personal style (items 8–12) were used. Items 13 and 14 were added to meet the need for more challenging items. The Self-rating Scale has a Likert scale with four response alternatives in frequency adapted for nonreaders with pictogram pictures. The Self-rating Scale has previously been validated in TD children in terms of construct validity [1]. All 14 items used are presented in Table 2.

Information about the children's daily TM was obtained using a *Parent Scale,* created by first author and a colleague. Items were generated from previous knowledge of the limitations in everyday situations often demonstrated by children with difficulties in TPA. For example, it was suggested that difficulties in time perception in children with ASD were related to disruptions in daily rhythm/sleep problems [12] (item 1). Many activities in daily living are done in a temporal sequence, e.g., making a snack, and managing such activities, is part of learning daily TM [6,13] (item 3). Item 5 was added to acquire information about whether the child shows proof of understanding time concepts in everyday situations [14]. Difficulties in time

Table 2
Statements in Self-Rating Scale of Autonomy

| | Statements |
|---|---|
| 1 | I make my own sandwiches |
| 2 | I do my chores |
| 3 | I know where my own things are |
| 4 | I can ask for help if I hurt myself |
| 5 | I decide what clothes to wear |
| 6 | I pack my own gymnastics clothes |
| 7 | I know what day we have gymnastics at school |
| 8 | I can be on time for a meeting/to meet a friend |
| 9 | What I do during spare time is my own choice |
| 10 | I participate in the decision about what my family will do on the weekend |
| 11 | I decide how to use my pocket money |
| 12 | My friends and I decide together what we will do |
| 13 | I can be on my own at home in the afternoon before my parents come from work |
| 14 | I check in my diary or a calendar to see how long it is until something special happens like my birthday |