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**Behavioral interventions in adolescents and young adults  
with high-functioning ASD:  
Improvement, generalization, and maintenance of adaptive skills**

Annemiek Palmen

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**Behavioral interventions in adolescents and young adults  
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Improvement, generalization, and maintenance of adaptive skills**

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*It always seems impossible until it's done*

Nelson Mandela

## **Chapter 1**

### **General introduction**





## **General introduction**

Adolescence and young adulthood are seen as life stages of increasing challenge for individuals with autism spectrum disorder (ASD) as preparations have to be made for the transition to adulthood (e.g., Gerhardt & Lainer, 2011, Hendricks & Wehman, 2009; LeBlanc, Riley, & Goldsmith, 2008; Seltzer et al., 2003). Although some individuals with ASD successfully accomplish the transition to adulthood, most (including those without intellectual disabilities – ID) are faced with significant difficulties in the areas of employment, social relationships, community participation, and independent living (e.g., Howlin, Goode, Hutton, & Rutter, 2004; Taylor & Seltzer, 2011). Results of studies on outcome in adult life of individuals with ASD but without ID (i.e., high-functioning ASD – HFASD) indicate that intellectual potential and academic achievement do not guarantee a better outcome. In persons with HFASD, adaptive functioning is a relevant factor in achieving better outcomes and a better quality of life (Billstedt, Gilberg, & Gilberg, 2011; Farley et al., 2009). However, the levels of adaptive skills of adolescents and young adults with HFASD show substantial limitations and a discrepancy has been found between overall cognitive ability and adaptive functioning, favouring IQ over real-life skills (e.g., Kanne et al., 2011; Kenworthy, Case, Harms, Martin, & Wallace, 2010; Klin et al., 2007). Given these findings, improving adaptive skills can be seen as an important issue in preparing individuals with HFASD for their transition to adulthood. In this light, the present thesis focuses on the use of behavioral interventions in improving, generalizing, and/or maintaining adaptive skills in adolescents and young adults with HFASD.

In the remainder of this chapter, background information is presented on (HF)ASD and the outcomes in adult life of individuals with HFASD, on the discrepancy between adaptive performance and cognitive abilities in individuals with HFASD, and on behavioral interventions as an approach to adaptive skill building. The chapter will be concluded with an outline of the studies reported in this thesis.

## **Autism spectrum disorders**

ASD refers to a spectrum of lifelong pervasive developmental disorders characterized by qualitative impairments in communication and reciprocal social interaction and the presence of restrictive, repetitive, or stereotyped patterns of behaviors, interests, and activities (American Psychiatric Association – APA, 2000). The spectrum includes autistic disorder (also named ‘autism’), Pervasive developmental disorder-not otherwise specified (PDD-

NOS), Asperger's syndrome (AS), Rett's syndrome, and Childhood disintegrative disorder (CDD). Differential diagnoses among the five subtypes of ASD (see DSM IV-TR; APA, 2000) are based on variations in the strictly defined features of autistic disorder, that is, on late onset, atypical presentation, or subthreshold symptoms of autistic disorder (i.e., PDD-NOS), on absence of delay in either cognitive or language development (i.e., AS), and on regression after a period (at least 2 years) of normal development (Rett's Syndrome and CDD).

Recent studies on the prevalence of the whole spectrum of ASD have provided estimates ranging from 60 to 70 per 10.000 (Fombonne, 2009). CDD and Rett's syndrome are relatively rare (i.e., about 2 per 100.000) and often not seen as being typical of the ASD label; when the term 'autism spectrum' is used in the literature it usually refers to the categorical groups of autistic disorder, AS, and PDD-NOS (Volkmar, State, & Klin, 2009). In a recent Dutch study on prevalence of ASD in school-aged (i.e., 4-16 year) children in three regions (Roelfsema et al., 2012), it was found that the prevalence rates by region varied from 57 to 84, and up to 229 (i.e., in the region with the relatively highest proportion of jobs in technology or ICT) per 10.000. However, as the estimated prevalence was based on an administrative school count, the actual prevalence rates of ASD in the Netherlands may be higher. Based on estimates published in the international scientific literature, Peters-Scheffer, Didden, Korzilius, and Matson (2012) estimated that in the Netherlands the number of individuals with ASD is approximately 99.000 to 165.000 of whom 23.570 to 39.283 individuals are between 0 and 20 years of age.

Many persons with ASD also have ID. Estimates indicate that up to 67% in the autistic disorder group meets criteria for ID (i.e., total IQ < 70), compared to 12% in the group with PDD-NOS and 0% in the group with AS (Chakrabarti & Fombonne, 2005). Persons with autistic disorder or PDD-NOS without ID are typically referred to as having high-functioning autism/PDD-NOS (HFA/PDD-NOS). It is not yet clear if HFA/PDD-NOS and AS represent distinct disorders (see e.g., Howlin, 2003; Paul, Orlovski, Marcinko, & Volkmar, 2009) and in studies on persons with ASD without ID, individuals with HFA/PDD-NOS and those with AS are often not clearly distinguished (i.e., HFASD). Although these high-functioning individuals usually demonstrate large spoken vocabularies and intact formal language, communication deficits in the areas of conversational pragmatics and social communication have been widely reported (Paul et al., 2009; Twachtman-Cullen, 1998). Their understanding of the more subtle aspects of social interaction is often limited, and their good vocabulary and often well-developed but restrictive interests give the impression that they are capable of far higher

levels of achievement than is actually the case (Howlin, 1998; Tsatsanis, Foley, & Donehower, 2004). Results of long-term follow-up studies in which persons with ASD were followed from childhood into adulthood have shown that the majority of the individuals with HFASD remain dependent on their families or professional services for the tasks of every day living (e.g., Farley et al., 2009; Howlin, 2000). It may be stated that individuals with HFASD in general show a striking discrepancy between ability and performance.

### **Adaptive functioning in individuals with HFASD**

#### *Outcomes from studies with adults*

Findings of group studies as well as long-term follow-up studies show that outcome scores in adult life (based on measures of education, work status, number and quality of friendships, and independence) vary between individuals with HFASD. On average, outcomes rated as 'good' or 'very good' were found in less than 50% of the participants (e.g., Farley et al., 2009; Howlin, 2000; Howlin, 2003; Howlin et al., 2004; Huskens, 1996). Above this, it has been suggested (see e.g., Howlin, 2000) that these high-functioning individuals may experience constant pressure to fulfil the demands of the society, which may lead to stress, anxiety, and even psychiatric problems which in turn further may impede social and educational progress (Howlin, 1998).

In a group study conducted in the Netherlands on successful adjustment in 49 adults (mean age = 27 years) with HFASD, Huskens (1996) found that outcome was 'good' (i.e., [near] normal social life and satisfactory functioning at school or work) for 4% of the participants and 'fair' (i.e., some social/educational progress despite significant abnormalities in behavior or interpersonal relationships) for 31%; 16% of the participants was living independently of which 10% needed support from others, 92% never had any long-term relationship, 12% had a full-time or part-time job while 50% was employed in a sheltered workshop, and 6% did not have any daytime activities. Findings of Howlin (2003) based on 76 individuals (mean age = 27 years) with high-functioning autism or AS indicated that 39% had friends and 34% was living (semi-) independently, 40% had obtained educational qualifications on the level required for university, and 47% had independent jobs or worked in a sheltered workshop. Farley et al. (2009) found somewhat better overall outcomes compared to the outcomes described in earlier studies which, according to the authors, could be explained by the local community support of the sample. In their follow-up study on 41 individuals with HFASD (mean age = 32 years), overall outcomes of 34% of the participants were rated as 'fair' (i.e., needing regular support in work and living, no particular friends) and

the outcomes of 17% was rated as 'poor' (i.e., very high level of support, no friendships outside of residential setting); no participants had a rating of 'very poor'.

Language and intellectual functioning have consistently been associated with better outcomes in samples of persons with ASD with and without ID (e.g. Billstedt, Gillberg, & Gillberg, 2005; Howlin et al., 2004). Another important factor seems to be adaptive behavior as limitations in functional independence impact the overall outcomes for individuals with HFASD. Adaptive behavior refers to the application of daily activities required for gaining personal independence and social sufficiency, including the functional use of age-appropriate communication skills, socialisation skills (e.g., interpersonal and leisure skills), and daily living skills (e.g., self-care, domestic, functional academic, and vocational skills) (Kenworthy et al., 2010; Sparrow, Balla, & Cicchetti, 1984). In their sample of adults with HFASD, Farley et al. (2009) found that among a range of variables including IQ, adaptive behavior measures (Vineland Adaptive Behavior Scales – VABS; Sparrow et al., 1984) were the variables most closely and positively related to better outcome. Across the adaptive domains the 'daily living skills' domain was most highly associated with better outcome. Adaptive behavior has also found to be related to quality of life in individuals with ASD. For example, in their follow-up study into early adult life of 108 individuals with ASD (with and without ID), Billstedt et al. (2011) found a significant relationship between good quality of life in adulthood and having regular recreational activities, independent of intellectual functioning.

The level of adaptive skill development is a main factor in determining an individual's level of functioning and independence (e.g., Kenworthy et al., 2010; Klin et al., 2007; Swiezy, Stuart, Korzekwa, & Pozdol, 2008). In assessing adaptive skills in adolescents and adults with HFASD, the VABS (Sparrow et al., 1984; Sparrow, Cichetti, & Balla, 2005) is mostly used. Results of several studies in individuals with HFASD indicate that the levels of their adaptive skills (i.e., communication-, daily living-, and socialization skills) are lower than would be predicted by their cognitive ability and lower than the levels of typically developing peers (Bolte & Poustka, 2002; Kanne et al., 2011; Klin et al., 2007). Although the adaptive behavior profile of individuals with HFASD may show variability across the three domains (e.g., relatively more impairment in the socialization domain), standard scores have found to be nearly two deviations below the mean (Kanne et al., 2011; Klin et al., 2007; Saulnier & Klin, 2007). Furthermore, in some cohort samples negative correlations have been found between age and adaptive skills scores, suggesting that over time individuals with HFASD do not make gains at a level commensurate with their chronological growth (Kanne et al., 2011; Klin

et al., 2007). This finding implies that the existing gap between cognitive ability and adaptive skills may increase with age.

Based on the central role adaptive skills play in quality of life and independence, adaptive skills interventions in adolescents and young adults with HFASD are strongly recommended as they may foster community-based living in adulthood and contribute to better long-term outcomes (e.g., Farley et al., 2009; Hume, Loftin, & Lantz, 2009; Kanne et al., 2011; Kenworthy et al., 2010; Klin et al., 2007; LeBlanc et al., 2008; Sheridan & Raffield, 2008). Surprisingly, intervention research on adaptive skill building in adolescents and young adults is limited. It has been found that the vast majority of intervention (i.e., treatment) studies have focused on young people with ASD. For example, Edwards, Watkins, Lotfizadeh, and Poling (2012) found that of the 146 intervention studies published between 2009 and 2012 in the four journals with the highest number of articles on interventions in individuals with ASD (i.e., *Autism*, *Focus on Autism and Other Developmental Disabilities*, *Journal of Autism and Developmental Disorders*, and *Research in Autism Spectrum Disorders*), 11% of the studies included at least one participant in the age of 15 to 20 years and only 4% included at least one participant above 20 years.

#### *Underlying cognitive processes*

It has been hypothesized that cognitive impairments and/or cognitive styles may underlie the difficulties individuals with HFASD have in everyday performance. For example, underdeveloped theory of mind (ToM) which refers to impairments in the ability to attribute subjective mental states to oneself and others (e.g., Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) may contribute to impairments in social communication and interaction. Deficits in executive functioning refer to problems with planning, inhibition, organization, cognitive flexibility, working memory, and/or mental representation of tasks and goals (e.g., Ozonoff, Pennington, & Rogers, 1991) and may for example contribute to rigidity and problems with flexibility in everyday behaviors. Next to this, weak central coherence refers to the local or detail-focused processing style that individuals with ASD may show, possibly leading up to missing more global processing information in context and for meaning (e.g., Happé & Frith, 2006), which for example may contribute to problems with (social) functioning and generalization.

Above hypotheses have led to the development of interventions aimed at improving cognitive abilities assuming that the applied performance in real life would also improve. However, improvements in cognitive tasks (i.e., conceptual measures) do not automatically

(i.e., without explicit training) reveal improvements in daily life (i.e., adaptive) behaviors (see e.g., Begeer et al., 2011; Fisher & Happé, 2005; Ozonoff & Miller, 1995). Conversely, it has been found that improvements in adaptive behaviors may not automatically result in improvements in cognitive skills (e.g., Chin & Bernard-Opitz, 2000; Teunisse et al., 2007). Furthermore, findings on cognitive tasks indicate that the above mentioned cognitive impairments and styles do not appear to be universal to individuals with HFASD (e.g., Geurts, Corbett, & Solomon, 2009; Roeyers, Buysse, Ponnet, & Pichal, 2001; Teunisse, Cools, Spaendonk, Aerts, & Berger, 2001). However, successful performance on cognitive tasks does not automatically involve success on performance in real-life situations of individuals with HFASD (see e.g., Kenworthy, Yeres, Gutermuth, & Wallace, 2008; Spek, Scholte, & Van Berkelaer-Onnes, 2011; Teunisse et al., 2001).

Given these findings, it seems that cognitive styles are not directly related to every day behaviors in individuals with HFASD. There may be several reasons for the discrepancies found between cognitive task and adaptive performance in individuals with HFASD. It has for example been suggested that the task condition and/or the nature of the task may be contributing factors; for instance, in a task setting the experimenter may explicitly point out what is relevant for the task and/or structured tasks or static tests are used, whereas in real life one needs to work out what aspects in the environment are important in that particular situation (e.g., Kenworthy et al., 2008; Klin, Jones, Schultz, & Volkmar, 2003). In addition to this, it has been hypothesized that the discrepant findings may indicate that the generalization of cognitive skills to daily life behavior is poor. It has also been suggested that cognitive training is too broad to result in improvements in daily life skills and that cognitive training should focus on more specific areas that should be measured with specific (i.e., more sensitive) measures of daily life skills (Begeer et al., 2011). Furthermore, skills needed in daily living are possibly not measured when using cognitive tasks which may be an indication of poor ecological validity of the measures used (e.g., Geurts et al., 2009; Kenworthy et al., 2008; Spek et al., 2011). In conclusion, it may be noted that the issue of discrepancies between cognitive ability and daily life performance in individuals with HFASD is not clear yet. From a practitioner point of view, it may further be concluded that results of interventions in improving cognitive abilities of individuals with HFASD are limited when reviewing the effects on the performance in daily life (i.e., adaptive skills).

Another intervention approach in improving the functional use of adaptive skills in adolescents and adults with HFASD may be interventions based on a behavioral model. Behavioral interventions have found to be effective in adaptive skill building in a variety of

atypical populations including young people with ASD. For example, Early Intensive Behavioral Intervention (EIBI) is the most promising intervention approach for children with ASD (e.g., Granpeesheh, Tarbox, & Dixon, 2009; Health Council of the Netherlands, 2009; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011).

### **Behavioral interventions in adaptive skill building**

#### *Studies on Applied Behavior Analysis*

Behavioral interventions are based on Applied Behavior Analysis (ABA). Baer, Wolf, and Risley (1968, 1987) described ABA as a scientific discipline that focuses on (a) practical meaningful behaviors, (b) direct measurement of behaviors, (c) use of well-controlled experimental designs (including single-case research designs), (d) operationally described procedures, (e) established principles of behavior analysis, (f) effects of practical value, and (g) generalization. Skinner set the occasion for the development of ABA by distinguishing between respondent and operant learning and introducing the concept of the three-term contingency (antecedent-behavior-consequence) to define ‘operant behavior’ (see e.g., Fisher, Groff, & Roane, 2011). Since Skinner’s definition of ‘operant behavior’, results of applied behavioral analyses have led to refinements of explanations of behavior in which the operant learning process is combined with other behavioral processes such as imitation, shaping, setting events, rule governed behavior, motivation, proximal and ultimate consequences, and response classes (Fisher et al., 2011; Smith, McAdam, & Napolitano, 2007). Behavioral interventions focus on systematically manipulating antecedent and consequent contextual stimuli, and consist of techniques such as the delivery of task analysis, response prompting, chaining, transfer of stimulus control and fading prompts, strategy instruction, model-lead-test-model, corrective feedback, and reinforcement (see e.g., Duker, Didden & Sigafos, 2004; Noell, Call, & Ardoin, 2011).

Although ABA did not emerge as an approach specific to individuals with ASD, at present strategies in ABA have the largest preponderance of evidence supporting their effectiveness in improving adaptive skills in young people with ASD (with and without ID) (Granpeesheh et al., 2009; Health Council of the Netherlands, 2009; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Simpson, 2005). Discrete trial teaching (DTT; e.g., Howard, Sparkman, Cohen, Green, & Stanislaw, 2005), incidental teaching (IT; e.g., McGee, Krantz, & McClannahan, 1986), and pivotal response training (PRT; e.g., Koegel, Carter, & Koegel, 2003) are interventions effectively used in adaptive skill building in children with ASD and are based on ABA methodology. Behavioral interventions in improving adaptive



skills in children and youth with (HF)ASD have targeted on several adaptive skill domains and concerned play skills (e.g., play with toys or peers), social skills (e.g., greeting, initiating a conversation), functional life skills (e.g., self-care-, domestic-, community skills), communication skills (e.g., speech, picture exchange), and academic skills (e.g., task completion, mathematics) (see e.g., Granpeesheh et al., 2009; Machalicek et al., 2008).

While improvement in skill performance may be the first focus of interventions in adaptive skill building, it is also important to ensure that skills are generalized and maintained over time (e.g., Baer et al., 1968; Minshawi, Ashby, & Swiezy, 2011). Generalization and maintenance are considered essential to skill mastery as the goal of adaptive skill building is not only improvement in skill performance in the situation in which the skill was initially trained, but also its functional application across time, contexts, materials, persons, and/or responses (e.g., Minshawi et al., 2011; Stokes & Baer, 1977). The effectiveness of behavioral interventions in adaptive skill building in individuals with (HF)ASD may be explained by the framework and set of strategies that ABA provides for addressing several challenges that may be encountered in improving, generalizing and maintaining adaptive skills in persons with (HF)ASD (Hume et al., 2009; Minshawi et al., 2011; Sheridan & Raffield, 2008). For example, the use of systematic, individualized, tailor made procedures makes it possible to encounter the heterogeneity in the learning style and abilities of individuals with (HF)ASD (e.g., LeBlanc et al., 2008; Tsatsanis, 2004; Tsatsanis et al., 2004); for instance, in improving adaptive skill performance, task analyses and prompt levels can be individualized according to the skill level of the individual (e.g., Sheridan & Raffield, 2008). Next to this, persons with (HF)ASD may show limited initiations and/or delayed responding (see e.g., Carnahan, Hume, Clarke, & Borders, 2009; Duffy & Healy, 2011). Such characteristics can limit learning opportunities and may contribute to dependency on adult delivered prompts in the performance of the adaptive skills (MacDuff, Krantz & McClannahan, 2001; Minshawi et al., 2011). In addressing this challenge, the use of (visual) technical supports and/or self-management strategies have been effective in children and youth with (HF)ASD (see e.g., Lee, Simpson, & Shogren, 2007; Van Laarhoven, Kraus, Karpman, Nizzi, & Valentino, 2010). Furthermore, the occurrence and maintenance of skills under non-training conditions may be problematic for persons with (HF)ASD (e.g., Arnold-Saritepe, Phillips, Mudford, De Rozario, & Taylor, 2011; Fein, Tinder, & Waterhouse, 1979). This difficulty with generalization has been attributed to factors such as insistence on sameness (e.g., Rincover & Koegel, 1975), lack of motivation (e.g., Koegel & Mentis, 1985), stimulus overselectivity (e.g., Lovaas, Koegel, & Schreibman, 1979), biased attention to local information (e.g.,

Happé & Frith, 2006), deficits in concept formation (Minshew, Meyer, & Goldstein, 2002), and/or poor flexibility (Kourkoulou, Leekam, & Findlay, 2012). It has been stated that the failure of generalization to occur is due to a failure in programming the intervention for generalization. To promote generalization, several ABA procedures have found to be effective (see e.g., Arnold-Saritepe et al., 2011; Noell et al., 2011). These procedures can be grouped into three general categories denoting three principles: (1) use natural consequences, functionally related to the response, (2) train diversely by using less rigid programming and/or multiple stimulus and response exemplars, and (3) incorporate mediators such as common stimuli (i.e., use of stimuli that are also present in the natural condition) (Stokes & Osnes, 1989). The teaching of rule-governed behavior for example by using self-management procedures and/or strategy instruction, the building of initiation, the use of naturalistic methodologies, and the manipulation of reinforcement have found to mediate generalization and maintenance (e.g., Cowan & Allen, 2007; Ghezzi & Bishop, 2008; Koegel, Koegel, & Parks, 1995).

Another issue of importance in adaptive skill building in individuals with (HF)ASD concerns the accurate implementation of interventions by natural care providers such as staff, parents, teachers, and therapists (e.g., LeBlanc, Gravina, & Carr, 2011; Tsatsanis et al., 2004). Natural care providers are often involved in implementing interventions in individuals with (HF)ASD as naturalistic procedures may be used (see e.g., Cowan & Allen, 2007). Individuals with ASD may also have multiple treatment providers possibly across multiple settings (LeBlanc et al., 2011). The success of interventions is dependent on the accurate application of the intervention techniques by their mediators and ABA has provided a set of procedures (collectively termed behavioral skills training – BST) for effectively addressing mediator training (e.g., Huskens, Reijers, & Didden, 2012; Sturmey, 2008; Van Vonderen, Duker, Didden, Lang, & Lancioni, 2011).

Outcome research on behavioral interventions in adaptive skill building in persons with (HF)ASD has historically focused on young people and a minority of the studies included participants beyond the age of early adolescence (see e.g., Granpeesheh et al., 2009; Machalicek et al., 2008). For example, in the review of Machalicek et al. (2008) on teaching adaptive skills in students with ASD in the age of 3 to 21 years, 118 participants were identified that met the inclusion criteria and only 5% of the participants were between 14 and 17 years; students older than 17 years did not participate in the studies. In addition, studies that targeted on improving adaptive skills in adolescents and/or young adults with ASD hardly focused on individuals with HFASD (e.g., Gerhardt & Lainer, 2011; Hendricks & Wehman,

2009; Tsatsanis et al., 2004). Next to this, data on maintenance and generalization were collected sparsely (Arnold-Saritepe et al., 2011; Machalicek et al., 2008; Wolery, Barton, & Hine, 2005).

*Profiling behavioral interventions in adolescents and young adults with HFASD*

The first studies on behavioral interventions in adaptive skill building in adolescents and young adults with ASD date from the eighties in the 20<sup>th</sup> century and targeted on improving social skills such as ‘making positive and negative assertions’ (e.g., McGee, Krantz & McClannahan, 1984), vocational skills such as improving ‘production rate’ (e.g., Smith & Coleman, 1986), and living skills such as ‘cleaning the sink’ (e.g., Smith & Belcher, 1985). Methodological limitations of these early studies, such as lack of experimental control, lack of data on interrater reliability, and/or failure to show improvement in skills in natural settings, impeded the validity of their conclusions. Since then, surprisingly few intervention studies have appeared on adaptive skills in adolescents and young adults with ASD as can be concluded from the, although not systematic, reviews by Matson, Benavidez, Compton, Paclawskyj, and Baglio in the nineties (1996) and recently by Matson, Hattier, and Belva (2012). Nevertheless, recent studies have demonstrated effectiveness of behavioral interventions in improving a variety in types of adaptive skills in adolescents as well as adults with ASD (see e.g., Granpeesheh et al., 2009; Machalicek et al., 2008; Matson et al., 2012).

An adaptive skill domain that has received more attention in recent intervention studies concerns improving leisure skills (e.g., Jerome, Frantino, & Sturmey, 2007). The relevance of this issue is obvious given the results of studies in adolescents and adults with ASD (with and without ID) indicating that having regular leisure activities contributes to their quality of life and that leisure engagement may be problematic especially when not included in service settings (e.g., Billstedt et al., 2011; Garcia-Villamizar & Dattilo, 2010; Orsmond, Wyngaarden Krauss, & Mailick Seltzer, 2004). As far as we know, improving leisure skills has not yet been a target of adaptive skill building studies in adolescents and adults with HFASD.

Interventions have been implemented in group- and/or one-to-one formats and in simulated- and/or natural settings. It is suggested that group formats offer a number of benefits over individual instruction in teaching adaptive skills such as, opportunities for observational learning and mutual feedback, efficiency in delivering intervention to more individuals at one time, presence of a more social environment to practice skills, and increased likelihood of generalization (see e.g., Dotson, Leaf, Sheldon, & Sherman, 2010;

Weiss & Harris, 2001). Teaching in natural settings is often suggested to be more efficient than teaching in simulated settings as it facilitates generalization; however, in adults with ASD and ID, training in simulated settings has shown to be effective in enhancing generalization of skills across settings in case generalization is programmed in the intervention (e.g., Lattimore, Parsons, & Reid, 2006). It may further be stated that a minority of the studies focused on generalization and maintenance in regular settings. For example in the review of Machalicek et al. (2008) it was found that of the six studies in which adolescents (age 14-17 years) participated, only two studies collected data on generalization and one study collected data on maintenance of intervention effects.

Among the ABA based techniques effectively used in adaptive skill building in adolescents and adults are task analysis, systematic prompt hierarchies, verbal instructions, modelling, error correction, various types of reinforcement, feedback, technical supports (e.g., written schedules, video-modelling), choice-making, and self-management strategies (e.g., Bellini & Akullian, 2007; Ganz & Sigafoos, 2005; Jerome et al., 2007; Watanabe & Sturmey, 2003). The use of self-management strategies applied alone or in combination with technical supports is recommended in promoting independent behavior in individuals with ASD (e.g., Koyama & Wang, 2011; Lee et al., 2007; Southall & Gast, 2011). Intervention programs that aim at teaching self-management have several potential benefits. For example, individuals may be more actively engaged in the intervention process, for instance by attending toward and evaluating their own behavior, which may contribute to the individual's motivation. Next to this, the independent use, generalization, and maintenance of skills may be facilitated by the process of transferring control from a supervisor to control from technical supports and/or the individuals themselves as they are enabled to control their own behavior. Furthermore, self-management is supported for its transportability and efficiency (e.g., Lee et al., 2007; Sheridan & Raffield, 2008). Among the technical supports used as self-management tools for prompting (e.g., video-modelling on desktop computer, prompts on iPod), handheld devices are considered most promising for increasing independency in skill performance given its compact size and portability (e.g., Cihak, Kessler, & Alberto, 2007). Next to this, handheld devices are relatively inexpensive. Self-management programs may be of great value for adolescents and young adults with HFASD in improving, generalizing, and maintaining adaptive skills, and will be part of the behavioral interventions discussed in the chapters of this thesis.

Behavioral intervention studies on adaptive skill building in adolescents and/or young adults with HFASD are sparse. For example, in the review of Lee et al. (2007) on the use of

self-management in students with ASD, only 1 of the 11 selected studies targeted on an adolescent (16 year old) with HFASD and this study aimed at improving social skills (i.e., Koegel & Frea, 1993). In the review by Machalicek et al. (2008) on school-based behavioral interventions for students with ASD, 1 of the 45 studies focused on an adolescent (14 year old) with HFASD and this study aimed at improving independency in completing daily tasks using a technical tool (i.e., Ferguson, Smith Myles, & Hagiwara, 2005). There have been published several reviews on individuals with HFASD and all of them focused on increasing social skills. For example, in their review of social skills training groups (SSTGs) for youth with HFASD, Cappadocia and Weiss (2011) found that of the 10 selected studies, 3 studies included adolescents (age  $\geq 14$  years) with HFASD. The interventions consisted of 8 to 12 weekly sessions containing group instruction and practice on social skills. Indirect measures were used as data were collected using tests, parent-questionnaires, and/or observations during role-play. Two of the studies reported significant pre-post improvements in social skills. No follow-up data were collected, however. Generalization to the regular environment was measured in two studies using parent-questionnaires and only one study revealed significant pre-post changes. These studies showed methodological limitations such as absence of a control group or lack of systematic measures on the behavioral skill targets of the study, thereby limiting the validity of conclusions. Next to this, studies lacked details on applied interventions impeding replication. Prior to the present study, no systematic reviews have been published on behavioral intervention research concerning adaptive skill building in young adults with HFASD.

Finally, in studies on adolescents and adults, interventions have been conducted by researchers (e.g., Jerome et al., 2007) as well as by regular care providers such as parents, teachers, and staff in natural settings (e.g., Ferguson et al., 2005). As inaccurate implementation of procedures may limit effectiveness and even strengthen incorrect behaviors, training of treatment providers and/or supervision on treatment implementation are important to warrant treatment integrity. Such training is especially recommended when intervention formats are used that involve performance that is variable and flexible (e.g., Sturmey, 2008). However, there appears to be little attention for this issue as may be concluded from the studies that are referred to in this section and from a review by Rispoli, Neely, Lang, and Ganz (2011) on studies in which paraprofessionals were trained to implement interventions for people with ASD. This review revealed that only 2 of the 12 selected studies focused on training paraprofessionals in providing behavioral interventions to adolescents or adults with ASD (and ID).

## **Outline of the present thesis**

The present thesis focuses on the use of time-limited behavioral interventions in improving, generalizing, and/or maintaining adaptive skills in adolescents and young adults with HFASD. Several claims are made beforehand.

Planning for transition to adulthood needs to begin during the early to middle teen years (i.e., adolescence) and thorough preparation and implementation are required (e.g., Hendricks & Wehman, 2009; Sheridan & Raffield, 2008). An emphasis should not only be placed on improving functional (i.e., adaptive) skills, but also on their generalization as individuals with (HF)ASD have substantial problems in generalizing skills across time (i.e., maintenance), across conditions (i.e., stimulus generalization), and across functionally related behaviors (i.e., response generalization) (e.g., Arnold-Saritepe et al., 2011). Furthermore, it is required that professionals working with adolescents and young adults with HFASD are knowledgeable of effective intervention strategies, are competent in implementing these strategies, and are competent in effectively coaching educational paraprofessionals in using these strategies (e.g., Gerhardt & Lainer, 2011). At present, however, there is a paucity of intervention studies on improving, generalizing, and maintaining adaptive skills in adolescents and young adults with ASD (e.g., Edwards et al., 2012; Health Council of the Netherlands, 2009; Matson et al., 2012; McClannahan, MacDuff, & Krantz, 2002), especially for those with HFASD (Farley et al., 2009; Howlin, 2000; Klin et al., 2007). Given the increasing demands for maximizing functional independence, community integration, and quality of life, there is an urgent need for effective intervention programs and research on adaptive skill building in adolescents and young adults with HFASD. Furthermore, the increasing financial costs associated with long term care of individuals with ASD also urge to develop time- and cost efficient intervention procedures (e.g., Ganz, 2007; Health Council of the Netherlands, 2009; Järbrink, McCrone, Fombonne, Zandén, & Knapp, 2007; Peters-Scheffer et al., 2012). As ABA is considered best practices for teaching adaptive skills to young people with (HF)ASD (Granpeesheh et al., 2009; Simpson, 2005), research is warranted on the effectiveness of ABA-based interventions for adolescents and young adults with HFASD.

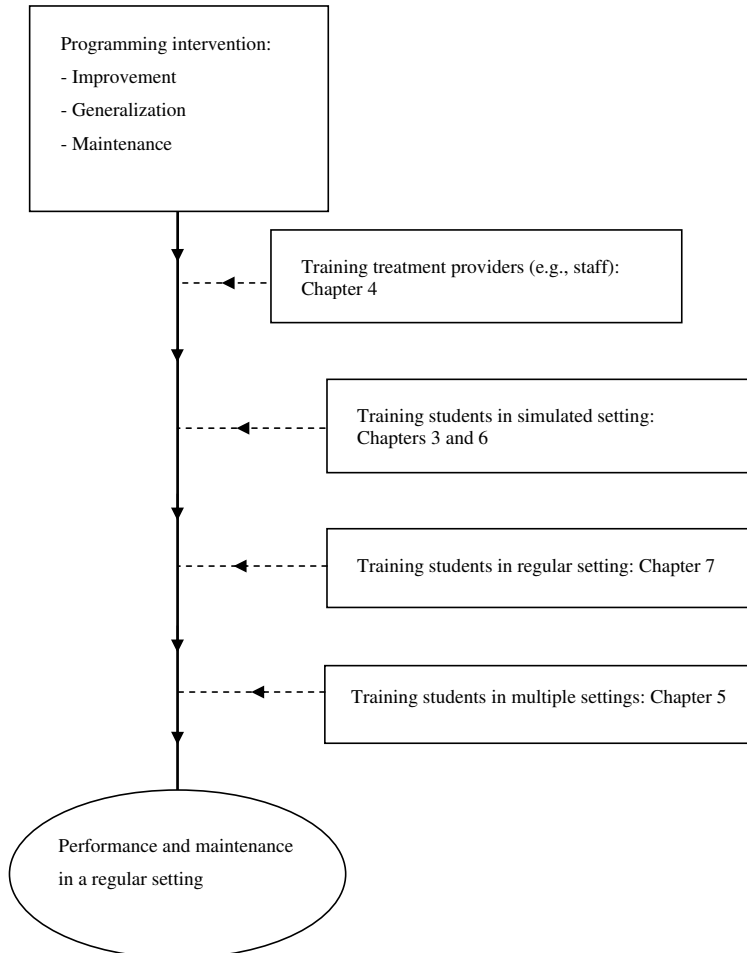
In present thesis, results of six studies on behavioral interventions in adaptive skill building in adolescents and young adults with HFASD are presented. Intervention studies were conducted in the Dr. Leo Kannerhuis, a specialized centre for autism in the Netherlands. The Dr. Leo Kannerhuis offers a broad range of methods of care, treatment, and support to people with ASD and those that are directly involved (e.g., family, school, work). One area of

treatment and research concerns adaptive functioning as many of the clients show impairments in adaptive skills while they want to take part in the (social) community, and live and/or work more independently.

The present thesis starts out with a systematic review of behavioral intervention research on adaptive skill building. In addition, a report on five empirical intervention studies is provided. The studies consist of two intervention studies conducted in a simulated setting, one intervention study implemented by staff in a regular (i.e., day treatment) setting, one intervention study implemented in multiple settings, and an intervention study on staff's use of ABA-skills during their regular training of adolescents with HFASD. The intervention studies aimed at improving the use of adaptive skills in a regular, daily life setting of the participants (i.e., generalization). Data on maintenance of the skills were collected in four intervention studies. Generalization and/or maintenance were programmed by making use of self-management techniques, multiple exemplars and/or settings, and/or common stimuli. Figure 1 illustrates how the behavioral intervention programs may contribute to student's performance in a regular setting. The adaptive skills targeted in the studies were diverse and concerned pivotal skills on daily living and socialisation. Targets were identified in consultation with staff and/or treatment plans of clients of the Dr. Leo Kannerhuis, and focused on functional skills needed in current and future life environments.

In *Chapter 2*, results are presented of a systematic review of behavioral intervention studies on adaptive skill building in young adults with HFASD. Research questions were: which types of adaptive skills have been targeted on in the studies and which intervention procedures are used? What are the results on improving, generalizing and maintaining adaptive skills? What are the methodological characteristics of the studies and what are promising areas in need for future research?

*Chapter 3* describes the results of a study on the effects of a small-group training in a simulated setting on 'question asking' during tutorial conversations in a regular setting. Several behavioral techniques were used such as, response discrimination, self-management, common stimuli, corrective feedback, and reinforcement. Research questions were: does the intervention package result in improvements of question-asking skills during regular tutorial conversations (i.e., generalization)? Do the results maintain at short-term follow-up?



**Figure 1.** Model showing how the behavioral intervention programs may contribute to students’ performance in a regular setting.

*Chapter 4* describes the results of behavioral skills training (BST) on the use of ABA-based skills by staff while they conducted their regular job-training of adolescents with HFASD. The BST consisted of one group training session (containing e.g., response discrimination, behavioral practice, multiple exemplars, and corrective feedback) and six individual supervisory feedback sessions. Research questions were: does BST result in improvements in the use of ABA-based skills by staff on a trained (by staff) target skill of



students? Does BST result in generalization and/or maintenance of staff performance? Does BST on staff performance result in changes in students' skills?

*Chapter 5* describes the results of an outpatient program for improving leisure lifestyle during daily living (i.e., generalization). The intervention contained several behavioral techniques to improve generalization, such as training in multiple settings and use of multiple exemplars, visual cues, and self-management strategies. Research questions were: does the intervention package result in changes in need for leisure support, changes in leisure activities, and/or changes in leisure satisfaction. What is the level of agreement in measures of leisure lifestyle between program participants and their relatives? What recommendations can be given for future research on leisure skills and on this type of interventions?

In *Chapter 6*, results are presented of a behavioral intervention package, implemented in a simulated setting, on task engagement of students in a regular job-training setting. Supplementary to the study in Chapter 3, data were collected on staff's use of prompts and reinforcement and also on maintenance effects at long-term (i.e., 6-month) follow-up. Research questions were: does the intervention package result in improvements of task engagement of students while performing regular job tasks in a regular setting (i.e., generalization)? Do the results maintain over time? Are there any changes in behavior of staff over time?

*Chapter 7* describes the results of an intervention in the use of a portable, digital support on independent transitioning between daily activities. Intervention was conducted by staff in a regular (i.e., day treatment) setting. Research questions were: does the intervention result in improvements and/or maintenance of participants' independent transitioning behavior? Does the intervention result in changes in prompt use by staff?

In *Chapter 8*, general conclusions are presented and implications of the results for practice and future research discussed. Finally, a summary completes the thesis.

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## **Chapter 2**

**A systematic review of behavioral intervention research on adaptive skill building in high-functioning young adults with autism spectrum disorder**

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### **Abstract**

This review involved a systematic search and analysis of behavioral intervention studies aimed at improving adaptive skills in high-functioning young adults with autism spectrum disorders. Through electronic databases and hand searching, 20 studies were identified meeting pre-determined inclusion criteria. Studies were summarized and analysed in terms of (a) participants, (b) adaptive skill(s) targeted for intervention, (c) intervention procedures, and (d) intervention outcomes. Certainty of evidence was assessed through critical appraisal of each study's design and other methodological characteristics. Social interaction skills were the most common intervention targets ( $n = 8$ ), followed by practical academic skills ( $n = 6$ ), vocational skills ( $n = 5$ ), and domestic skills ( $n = 1$ ). Improvements in adaptive skills were reported by 19 studies. Interventions consisting of low or high tech assisted procedures (e.g., video modelling, visual cues, self-recording and self-reinforcement, self-prompting), reinforcement contingencies, and corrective feedback using prompts were found to be most promising. Five studies were identified as having the methodological rigor to provide conclusive results. Insufficient control for alternative explanations for behavior outcomes and reliance on pre- or quasi-experimental designs hindered the certainty of evidence for the remaining studies. Implications for clinical practice and future research are discussed.

**A systematic review of behavioral intervention research on adaptive skill building in high-functioning young adults with autism spectrum disorder**

Independent functioning is an important issue for people with high-functioning autism spectrum disorders (ASD). Adults with ASD have difficulty developing reciprocal friendships, obtaining paid employment, engaging in recreational activities, and living independently (e.g., Billstedt, Gillberg, & Gillberg, 2005; Eaves & Ho, 2008; Howlin, Goode, Hutton, & Rutter, 2004; Orsmond, Wijngaarden Krauss, & Mailick Seltzer, 2004). Consequently, many adults with ASD rely on support from parents or service agencies (e.g., Billstedt et al., 2005; Eaves & Ho, 2008; Farley et al., 2009; Howlin et al., 2004.). Farley et al. (2009) analysed variables related to adult outcomes in 41 high-functioning adults with ASD and found that among a range of variables such as IQ and level of support, adaptive behavior measures (Vineland Adaptive Behavior Scales; VABS – Sparrow, Balla, & Cicchetti, 1984) were the variables most closely related to overall social and independent living functioning. Across adaptive behavior measures, the daily living skills domain (VABS) was found to be most closely related to better outcomes.

In studies on adaptive functioning in persons with high-functioning ASD a discrepancy has been found between level of adaptive skills and IQ. Specifically, the adaptive skills are lower than would be predicted by cognitive ability (Bolte & Poustka, 2002; Carter et al., 1998). Furthermore, there is evidence that this discrepancy between cognitive ability and adaptive function may increase with age (Bolte & Poustka, 2002; Carter et al., 1998; Kanne et al., 2011; Klin et al., 2007). Given the importance of adaptive skills and the tendency for deficits to grow more pronounced over the lifespan, it is not surprising that a great deal of intervention research has focused on teaching adaptive skills to people with ASD.

Most studies on adaptive skill building have focused on children and adolescents with ASD, with and without intellectual disability (ID), and behavioral techniques, such as task analyses, cue cards, modelling, self-management, prompt fading, and reinforcement have proven to be highly effective (e.g., Koegel, Vernon, & Koegel, 2009; Paterson & Arco, 2007; Pierce & Schreibman, 1994; Taylor, Hughes, Richard, Hoch, & Rodriguez Coello, 2004). The effectiveness of cognitive skills training (e.g., Theory of Mind – TOM or Executive Functioning) on improving daily life behavior has also been studied. However, results suggest that these procedures may be effective in improving conceptual skills, but they do not automatically (that is without explicit training) lead to improvement in daily life use of TOM or executive skills, such as responding to indirect hints, social tuning, orientation in



time/place/activity, planning ahead, or following verbally given lists of instructions (Begeer et al., 2011; Fisher & Happé, 2005).

Several literature reviews have analysed behavioral interventions in adaptive skill building in children, indicating early intensive behavioral intervention (EIBI) is the most promising intervention approach for children (Granpeesheh, Tarbox, & Dixon, 2009; Makrygianni & Reed, 2010; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011). Literature reviews on behavioral interventions in heterogeneous samples of children and youth have also been conducted. For example, Rao, Beidel, and Murray (2008) and Cappadocia and Weiss (2011) provided preliminary evidence for the efficacy of social skills training groups (SSTGs) in improving social skills in children and youth with Asperger syndrome and high-functioning ASD. Support has also been found for the efficacy of self-management (e.g., Lee, Simpson, & Shogren, 2007) and video (self)-modelling (e.g., Bellini & Akullian, 2007) in children and adolescents with ASD. Machalicek et al. (2008) reviewed adaptive skills interventions implemented only in schools (participants with ASD ranged in age from 3 to 21) and found that behavioral interventions had been effective in improving academic, communication, functional life, play and social skills. However, concerns regarding the variability of the skills targeted, participant characteristics, instructional procedures, and the magnitude of behavioral change prevented definitive conclusions.

Surprisingly, research on adaptive skill building in young adults (16 years and above) is limited, despite their lifelong impairments in adaptive functioning. In a recent albeit not systematic review, Matson, Hattier, and Belva (2012) summarized behavioral intervention research on improving work skills, self-help, leisure, hygiene, and feeding in adolescents and adults with ASD. Authors concluded that, while behavioral procedures were effective, adaptive living skills of adolescents and adults are understudied and should be researched more intensively given the impact of these skills on quality of life and independent functioning. Almost all studies in Matson's et al. review focussed on persons with ASD and ID. As there is a need for intervention programs targeting adaptive skills in high-functioning young adults with ASD (e.g., Farley et al., 2009) additional research is needed on the efficacy of behavioral interventions in this target group.

At present, no systematic review covering behavioral interventions for adaptive skill building in high-functioning young adults with ASD has been published. Given the importance of independent functioning, the need to explicitly target adaptive skills, and the financial cost associated with long term care of individuals with ASD (Järbrink, McCrone, Fombonne, Zandén, & Knapp, 2007), a systematic review on this topic is warranted. The

purpose of this review is to systematically examine the state of research on behavioral interventions in improving adaptive behavior in young adults with high-functioning ASD in order to (a) evaluate research areas, techniques, and outcome measures and to (b) identify limitations and promising areas in need of future research.

## **Method**

### *Search procedures*

First, systematic searches were conducted in four electronic databases: Education Resources Information Center (ERIC), PsycINFO, PubMed, and Web of Science. In all four databases the search was limited to articles written in English and published between January 1990 and August 2010 in peer-reviewed journals. The keywords fields in all four databases were searched using various forms and combinations of the terms “autism”, “Asperger’s syndrome”, “pervasive developmental disorder”, “youth”, “adolescents”, “adults”, and “behavioral intervention”, “adaptive”, “daily living”, “self-help”, “social”, “communication”, “leisure”, “academic”, “vocational”, “job”, and “community”. Abstracts identified in the search were screened for possible inclusion (see *Inclusion and exclusion criteria*). Following the database search, hand searches, covering August 2010 to August 2011, were completed for the journals containing the included studies. Finally, the reference lists of the studies that met inclusion criteria were reviewed to identify additional studies for inclusion. A total of 106 abstracts were identified for further screening.

### *Inclusion and exclusion criteria*

To be included in this review studies had to meet four inclusion criteria. First, at least one of the participants had to be 16 years or older, diagnosed with an autism spectrum disorder (ASD) and have a Full scale IQ or Verbal IQ of 70 or above. In studies in which IQ data were not reported, the participant had to be diagnosed with Asperger’s syndrome (AS), described as “high-functioning”, and/or have age appropriate language skills (e.g., Dotson, Leaf, Sheldon, & Sherman, 2010; Fullerton & Coyne, 1999; Gentry, Wallace, Kvarfordt, & Lynch, 2010). Second, the study had to involve at least one dependent variable related to adaptive living skills. For the purpose of this review, an adaptive skill was defined as a behavioral skill that is related to social interactions (e.g., initiating or maintaining conversations, voice intonation) or daily living (i.e., self help-, domestic-, community-, leisure-, academic-, or vocational skills) (e.g., Kenworthy, Case, Harms, Martin, & Wallace, 2010; Sparrow, Cicchetti, & Balla, 2005). Third, the intervention had to involve procedural components based upon applied behavior

analysis (ABA), such as task analysis, prompting, and reinforcement. Studies in which researchers explicitly identified the intervention as cognitive behavioral in nature were also included (e.g., Turner-Brown, Perry, Dichter, Bodfish, & Penn, 2008). Finally, the study had to contain systematic data-collection procedures (e.g., structured questionnaires, rating scales, tests, and/or direct observations) and present at least two data points, for example one data point at pre-test/baseline and one data point at post-test/intervention, or two data points during intervention with at least one data point at the beginning and one data point at the end of the intervention (i.e., routine outcome monitoring).

Studies were excluded for three reasons. First, studies that only provided anecdotal data (e.g., narrative case reports or descriptive observations) were excluded (e.g., Burt, Fuller, & Lewis, 1991). Second, studies that only presented results on group level were excluded if participants' characteristics showed that age and/or IQ ranged from below to meeting inclusion criteria and the mean age of the group of participants was lower than 16 years and/or the total mean IQ score was below 70 (see e.g., Bauminger, 2002; Herbrecht et al., 2009; Tse, Strulovitch, Tagalakis, Meng, & Fombonne, 2007). Third, studies that targeted only cognitive skills or overall competence (e.g., emotion recognition, Theory of Mind, friendships, employment) were excluded in order to maintain the emphasis on interventions targeting behavioral performance (e.g., Golan & Baron-Cohen, 2006; Smith, Gardiner, & Bowler, 2007). Finally, studies that primarily targeted decreasing problem behaviors were excluded in order to maintain focus on increasing adaptive behaviors (e.g., Gerdtz, 2000). Ultimately, 20 studies were selected for inclusion in this review.

### *Data extraction and coding*

The following features of the included studies were summarized: (a) participant characteristics, (b) adaptive skills targeted, (c) components of intervention procedures, (d) intervention outcomes, including measures on follow-up (FU), generalization (Gen), and social validity (SV), and (e) certainty of evidence. Various procedural aspects were also noted, including setting, intervention format, experimental design, method of data collection, interobserver agreement (IOA), and treatment fidelity (TF).

Treatment outcomes for the included participants were first summarized as reported by the authors of the study (e.g., pre-post changes, statistical significance, and/or percentage of non-overlapping data). We further classified outcomes as positive, negative, or mixed (Machalicek et al., 2008). Results were classified as 'positive' if all the targeted adaptive skills of all the participants improved or if significant group improvements were found in all

the targeted adaptive skills. Results were classified as 'mixed' if some but not all the targeted skills improved and some participants remained constant or declined. 'Mixed' was also used if group means showed improvements in some but not all of the targeted skills. Results were classified as 'negative' if none of the participants benefited from the intervention and performance remained constant or declined for all the targeted adaptive skills, or if no significant improvements were found.

Design and other methodological characteristics were considered when evaluating the quality of evidence for each included study (Schlosser, Wendt, & Sigafoos, 2007). The certainty of evidence hierarchy described by Lang, Regester, Lauderdale, Ashbaugh, and Haring (2010), Ramdoss, Lang, et al. (2011), and Ramdoss, Mulloy, et al. (2011) was used in which studies are rated as either 'conclusive', 'preponderant', or 'suggestive' in their quality of evidence. Within the lowest level of certainty, classified as suggestive evidence, studies did not use a true experimental design. Studies in the suggestive category may have utilized a pre- or quasi-experimental design such as an AB-design, or pre-post control group design without randomization and blinding. The second level of certainty, classified as preponderant evidence, contained studies utilizing a true experimental design (e.g., group design with random assignment, multiple baseline/probe design, or reversal design) and the following four qualities: (a) adequate interobserver agreement outcomes (i.e., 80% or higher agreement or reliability in at least 20% of sessions), (b) adequate treatment fidelity measures/outcomes, (c) operationally defined dependent measures, and (d) sufficient detail on intervention procedures to enable replication. In addition to these attributes, studies at the preponderant level were found to be lacking in their control for alternative explanations for treatment outcomes (e.g., concurrent interventions targeting the same dependent variables). The highest level of certainty, classified as conclusive, contained studies that (a) utilized true experimental designs, (b) contained the four qualities of the preponderant level and (c) contained design features that provided at least some control for alternative explanations for intervention outcomes. For example, a multiple baseline design in which the introduction of the intervention is staggered across at least three participants and concurrent interventions and/or attention are held constant.

#### *Reliability of search procedures and data extraction*

Using the inclusion and exclusion criteria, a total of 106 studies were further screened for possible inclusion in this review. After this initial screening 23 studies were identified for possible inclusion. The first and second author applied the inclusion criteria to the list of 23

potential studies. Agreement was obtained on 21 of the 23 studies. Hillier, Campbell, et al. (2007) and Mawhood and Howlin (1999) were identified for inclusion by one author and for exclusion by the other. Ultimately, the study of Mawhood and Howlin was excluded because behavioral data contained only a single data point. The study of Hillier, Campbell, et al. was included. Two studies were identified for exclusion by both authors. The study by Barnhill, Tapscott Cook, Tebbenkamp, and Smith Myles (2002) was excluded because no systematic measures were reported on the behavioral target of the study (i.e., responding to facial expressions) and Hillier, Fish, Clopper, and Beversdorf (2007) was excluded because the counselling program did not contain procedural components based upon ABA. As a result, 20 studies were included in this review.

After the list of included studies was agreed upon, the first author extracted information to summarize the studies. The accuracy of these initial summaries was independently checked by the second author using a checklist including the summary of the study and five questions on accuracy of the summary, specifically: (a) is this an accurate description of included participants?, (b) is this an accurate description of targeted adaptive skills?, (c) is this an accurate description of the intervention?, (d) is this an accurate summary of the results?, and (e) is this an accurate summary of the certainty of evidence? In cases where the summary was not considered accurate the authors discussed disagreements and changes were made to improve the accuracy of the summary. This process was repeated until the authors were in 100% agreement regarding all of the summaries. Using this procedure, inter-rater agreement on data extraction and analysis could be assessed. There were 100 items on which there could be initial agreement (i.e., 20 studies with 5 questions per study). Initial agreement was obtained on 86 items (86%).

## **Results**

Table 1 provides a summary of participant characteristics, adaptive skills targeted, intervention procedures, outcomes, and certainty of evidence for each of the 20 included studies.

### *Participants*

A total number of 116 persons participated in the studies. The sample size of participants ranged from 1 to 22 and seven studies contained more than 6 participants (Fullerton & Coyne, 1999; Gentry et al., 2010; Hillier, Campbell, et al., 2007; Howlin & Yates, 1999; Palmen, Didden, & Arts, 2008; Turner-Brown et al., 2008; Webb, Miller, Pierce, Strawser, & Jones, 2004). A total of 97 participants (83.6%) met the inclusion criteria and data are presented

**Table 1.** Summary and analysis of included studies.

Included studies	Participant characteristics	Targeted adaptive skill(s)	Intervention procedures	Outcomes and certainty of evidence
Allen, Wallace, Greene, et al. (2010)	N = 3/2 2 males (PDD-NOS; IQ: NR, cognitive functioning within typical and borderline range), 22 and 19 years old	Multiple tasks in a mascot job (e.g., waving, hand shaking)	General instruction was compared to video modelling: <i>General instruction:</i> general (verbal) task statement <i>Video modelling:</i> watching video (i.e., job behaviors are shown in scripted and naturalistic settings) and general task statement	<i>Results:</i> Positive: Improvements (almost) immediately followed video modelling; mastery criterion was reached in both participants, although performance was not stable; FU: Yes; Gen: Yes; SV: Yes <i>Certainty:</i> Preponderant: true experimental design; starting points of intervention were staggered over small amounts of time across three participants; results were replicated in third participant (mild ID). Baseline and intervention consisted each of one (6- to 16- min) session per participant (minute-by-minute analyses), indicating limited control on data variability over time. The relative simple task set may have effect outcomes positively. Adequate scores on IOA; TF not reported, however, researcher ensured video ran as designed
Allen, Wallace, Renes, et al. (2010)	N = 4/2 2 males (AS, Autism, IQ: NR, cognitive functioning within typical and borderline range), 16 and 17 years old	Multiple tasks in a mascot job	General instruction was compared to video modelling: <i>General instruction:</i> general (verbal) task statement <i>Video modelling:</i> watching video (i.e., job behaviors are shown in scripted and naturalistic settings) and general task statement; video modelling was repeated in case mastery criterion was not met within one 10-min job session	<i>Results:</i> Positive: Small improvements followed first video modelling; mastery criterion was met by both participants following second video viewing, performance was not stable; FU: Yes; Gen: No; SV: Yes <i>Certainty:</i> Preponderant: true experimental design, starting points of intervention were staggered over small amounts of time across four participants. Findings were replicated in two participants; one of them (mild ID) needed one video viewing in reaching criterion, the other one (mild ID) needed a second video viewing. Given variability in data and completion of baseline and intervention conditions within one day, control for alternative explanations is limited. Adequate IOA scores; TF not reported, however, researcher ensured video ran as designed

<p>Bousssein et al. (2008)</p>	<p>N = 1/1 1 male (AS); 19 years old</p>	<p>Task engagement: (a) task completion (b) on task behavior</p>	<p>General instruction was compared to specific instruction: <i>General instruction:</i> general (verbal) task statement, non-specific praise <i>Specific instruction:</i> verbal task statement on goal and time frame, non-specific praise, fading schedule for task goals</p>	<p><i>Results:</i> Positive: (a) task completion improved from stable baselines to gradual increases, following (changes in) specific instruction, for each task; (b): mean improvements in on task behavior for each task, following specific instruction; FU: No; Gen: No; SV: No <i>Certainty:</i> Conclusive: true experimental design, starting points of intervention were staggered over time across three task types and changes in criteria for task goals (different for each task type) were followed by skill gains, providing control for alternative explanations. Adequate scores on IOA; TF not reported, however, a single component procedure was used</p>
<p>Burke et al. (2010)</p>	<p>N = 6/6 6 males (AS); n = 4, PDD-NOS; n = 2; cognitive functioning from above average to borderline range); 18 to 27 years old</p>	<p>Occurrence of 63 job tasks in a mascot job; tasks were categorized in three response types: (a) response to cues from facilitator (e.g., responding within 5 sec of requests) (b) response to cues from audience (e.g., encouraging audience by shaking head), (c) response to cues from scripts (e.g., initiating interaction)</p>	<p><i>Study 1</i> (n = 3): General instruction was compared to behavioral skills training (BST) that was followed by a PDA-based, performance cue system (PCS); if criterion was not reached <i>Study 2</i> (n = 3): General instruction was compared to PCS that was followed by BST (without instruction, video-modelling, and home work) if criterion was not reached <i>General instruction:</i> modelling of basic mascot actions followed by general (verbal) task statement <i>BST:</i> instruction (script), live-, and video-modelling, practice, feedback (i.e., specific praise, corrective teaching), homework and practice log <i>PCS:</i> display of text cues (one cue per task) on an iPod inside the mascot, cues are applied by an assistant</p>	<p><i>Results:</i> <i>Study 1:</i> Positive: one participant reached mastery criterion following five BST sessions (without PCS); two participants reached mastery criterion (almost) immediately following BST and PCS <i>Study 2:</i> Positive: two participants reached mastery criterion immediately following PCS; one participant needed additional use of BST to reach mastery criterion FU: Yes; Gen: Yes; SV: Yes <i>Certainty:</i> Suggestive: true experimental design, starting points of intervention were staggered across participants and a reversal (removal and reintroduction of PCS or BST) was conducted with one (study 1) or all participants (study 2), behavior changes followed interventions and reversals. BST was needed by 1 participant in 2<sup>nd</sup> study, refraining from attributing results solely to PCS; adequate scores on IOA; insufficient detail on intervention procedures to enable replication, TF was not reported</p>
<p>Davis et al. (2010)</p>	<p>N = 3/3 3 males (AS); 16, 17 and 17 years old</p>	<p>Time engaged in others- focused interaction, i.e., saying</p>	<p>Conversational skill training was compared to Power card strategy: <i>Conversational skill (pre-) training:</i></p>	<p><i>Results:</i> Positive: all participants met mastery criterion following power card intervention; M PND= 100; Fu: No; Gen: Yes; SV: Yes</p>

<p>name of partner, presenting questions/comments about partner's interest, and listening while maintaining eye contact</p>	<p>model-lead-test, practice, multiple exemplars, visual cues, praise, error correction using guiding questions <i>Conversation probes</i>: verbal prompt to discuss an interest of the conversation partner <i>Power Card procedure</i>: <i>Instructional format</i>: explanation <i>Power Card strategy</i> (including scripts on Special Interest Area-SIA), instruction, rehearsal <i>Conversation probes</i>: verbal prompt to use power script and card during conversation, feedback following probes</p>	<p><i>Certainty</i>: Preponderant: true experimental design; starting points of intervention were staggered over time across three participants. The concurrent use of a SIA script, prompts to use cards and feedback following intervention probes may have effect outcomes positively and refrains from attributing results solely to the power card strategy. Adequate scores on IOA and TF</p>	
<p>Delano (2007)</p>	<p>N = 3/1 1 male (AS); 17 years old</p>	<p>Written language performance: (a) rate of words written (b) rate of functional essay elements</p>	<p><i>Results</i>: Positive: mastery criterion met for each skill following SRSD; FU: Yes; Gen: Yes; SV: No <i>Certainty</i>: Preponderant: start of intervention was staggered over time for both skills; gradually skill improvements in skill (a) following the intervention for that skill, improvements in skill (b) immediately following intervention skill (b). No control for potential interference from intervention skill (b) on increases in skill (a), following start intervention skill (b). Replications across two participants confirm findings; however, these participants did not meet the age criterion of the present review, limiting evidence for review's age group. The concurrent use of video creation refrains from attributing results solely to video self-modelling. Adequate IOA; TF was not reported, however, researcher observed video was run</p>
<p>Dotson et al. (2010)</p>	<p>N = 5/3 2 females and 1 male (Autism, PDD-NOS, and AS described; IQ: NR, described as having "good language"); 18, 17,</p>	<p>Conversation skills: (a) conversation basics, i.e., eye contact, voice tone, distance, body posture (b) delivering positive feedback,</p>	<p><i>Results</i>: Mixed: following program, all participants met mastery criteria for skills (b) and (c); 2 out of 3 participants met mastery criterion for skill (a); FU: Yes; Gen: Yes; SV: No <i>Certainty</i>: Conclusive: true experimental design, intervention was staggered across three skills and increases immediately followed start of intervention, the design was replicated with five participants (also one participant diagnosed with PDD-NOS, but</p>



Fullerton and Coyne (1999)	and 17 years old, respectively N = 8/8 2 females and 6 males (HFA and/or AS); 16 to 27 years old	(c) answering/asking open-ended questions Quality of dyadic conversations skills, e.g., turn taking, eye contact, paraphrasing	Communication program unit in SSG: Concept instruction and discussion, visual and written information on skills, response identification, discussion, videotaped role-play, and self-reflection on role-play using checklists	<16 years old) indicating fair control for alternative explanations; adequate scores on IOA and TF  <i>Results:</i> Positive; 2 speech-language therapists identified post responses adequately on dyadic scenario for all participants; FU: Yes; Gen: Yes; SV: No <i>Certainty:</i> Suggestive: pre-experimental design (no control group); target skills not operationally defined; qualitative data; insufficient detail on intervention to enable replication; adequate IOA; TF was not reported; in analyzing data, therapists were familiar with the participants and the intervention, this may have influenced results positively
Gentry et al. (2010)	N = 22/22 4 females and 18 males (Autism; IQ: NR, described as “high functioning”); mean age = 16.5 years old (range 14-18 years)	Task-management: (a) performance in everyday life tasks: keeping appointments, household-, homework- and medication management (b) satisfaction with performance	Intervention in use of PDA as task-management tool: <i>Training:</i> stepwise procedure, instruction, modelling, rehearsal, reinforcement <i>Post-training:</i> participants may contact investigator by email or phone with “trouble-shooting” questions	<i>Results:</i> Positive; statistically significant pre-post improvement in performance and satisfaction with performance of everyday life tasks; FU: No; Gen: No; SV: Yes <i>Certainty:</i> Suggestive: pre-experimental design (no control group); qualitative data, questionnaires were not validated; insufficient detail on intervention procedures; IOA and TF were not reported, however, use of PDA was registered in the device; additional prompts by parents may have effect outcomes positively
Hillier, Campbell, et al. (2007)	N = 9/9 1 female and 8 males (AS; $n = 6$ , Autism: $n = 3$ ; mean Full scale IQ = 111, IQ range 95-131); Mean age = 22 years (age range 18-36)	Job skills: (a) Vocational skills, e.g. task transitioning, asking for help (b) Work-related social skills, i.e., communication with employer, greeting	Supported employment: <i>Pre-placement services:</i> assessment, instruction in job search skills, “help” in search for employment, practice, videotaped role-play, review of performance <i>On-site job coaching support:</i> “help” with understanding job tasks or work place rules, providing conversation topics, training in job tasks (when necessary), psycho-education of employers and co-workers <i>Follow-on support:</i> evaluation, support in case of problems or job changes (i.e., discussing solutions,	<i>Results:</i> Mixed: (a) group mean ratings ( $n = 6$ ) showed improvements during support program (from 3 month to 12 month measures) in 3 items; performances on the other 14 items showed only slight increases and decreases; (b) group mean ratings ( $n = 6$ ) showed improvements in all skills, from 3 month to 12 month measures; FU: No; Gen: No; SV: Yes <i>Certainty:</i> Suggestive: pre-experimental design (no control group); qualitative data, questionnaires were not validated; insufficient detail on intervention procedures; individual differences such as number of hours worked or type of employment may have effected outcomes; IOA and TF were not reported

Howlin and Yates (1999)	N = 10/10 10 males (AS or Autism; non-verbal IQ range 86-138, no significant language deficits); mean age = 28 years (range: 19-44)	Conversational skills: (a) initiating and maintaining conversations, (b) use of general statements, (c) inappropriate social utterances, and (d) appropriate responses	counselling, or training on the job)  Social skills group: Concept instruction and discussion, multiple exemplars, videotaped role-play, feedback from video recordings, structured games, and team activities (e.g., job interviews)	<i>Results:</i> Mixed: mean pre-post data on two simulated social activities reveal significant improvements in skill (a) and skill (d) following SSG; a significant decrease in skill (c) was found on one of the social activities and decreases (not significant) in skill (b) were found on both social activities following SSG; FU: No; Gen: No; SV: Yes <i>Certainty:</i> Suggestive: pre-experimental design (no control group), target skills not fully operationally defined, insufficient detail on intervention; TF was not reported despite compound procedure; IOA range 75-100%
Koegel and Frea (1993)	N = 2/1 1 male (Autism; Full Scale IQ = 71); 16 years old	Non-verbal skills: (a) eye gaze and (b) nonverbal mannerisms	Self-management: <i>Pre-treatment:</i> response identification/ discrimination, modelling, imitation, instruction in self-recording <i>Treatment self-management:</i> self-recording and self-reinforcement using escalating intervals	<i>Results:</i> Positive: improvements in both skills following self-management; FU: No; Gen: Yes; SV: No <i>Certainty:</i> Preponderant: intervention was staggered over time across 2 skills in the included participant and across 1 other skill in another participant (13 year old), limiting control for alternative explanations. Description of (pre-) treatment sessions lacks some detail. Adequate IOA; TF was not reported, participant's use of self-management was videotaped and recorded which may serve the same function as TF
Mechling et al. (2009)	N = 3/1 1 male (Autism; Full Scale IQ = 75); 16 years old	Completing cooking recipes using a personal digital assistant (PDA)	Self-prompting using a PDA: <i>Pre-training</i> (technical use PDA): instruction, prompting <i>Training</i> (use PDA in self-prompting, i.e., use of task-steps and picture-, video-, auditory-, and combined prompts in a least to most hierarchy per step): corrective verbal and gesture prompts, social reinforcement	<i>Results:</i> Positive: mastery criterion met for each cooking recipe, following PDA-training; PND = 100%; FU: Yes; Gen: No; SV: Yes <i>Certainty:</i> Conclusive: the design controlled for recipe order in training, showing immediate improvements following intervention; results were replicated with 2 other participants having moderate ID, limiting evidence for review's target group. Limited detail on pre-training procedure; however, details on training were sufficient to enable replication. Adequate scores on IOA and TF
Palmen et al. (2008)	N = 9/9 2 females and 7 males (ASD; Verbal IQ range: 82-131);	Question asking during tutorial conversations	Silence prompts were compared to behavioral skills training (BST): <i>Baseline:</i> silence prompts during tutorial conversations; two group	<i>Results:</i> Positive: correct questions improved for all participants following BST, a significant increase was found for group; FU: Yes; Gen: Yes; SV: Yes <i>Certainty:</i> Conclusive: a true experimental design was used,

<p>age range 17–25 years</p>	<p>Sessions (no training principles in effect)  <i>BST</i>: concept instruction, task analyses, response discrimination, modelling, descriptive feedback, role-play and (self-) instruction using a flowchart, specific praise, corrective feedback using least to most prompting, table game, and rewards; tutorial conversations as in baseline</p>	<p>Intervention was staggered over time across three groups of participants (<math>n = 3</math>); baseline group sessions to control for increased attention during intervention and silence prompts during baseline conversations provided control for alternative explanations. Additional prompts by personal coaches may have biased outcome, however, this also may have been in effect during baseline. TF was not reported, however, trainer used a flowchart of the procedure to control for variations in implementation; adequate IOA scores</p>		
<p>Shields-Wolfe and Gallagher (1992)</p>	<p>N = 1/1          1 male (Autism; IQ: NR; described as “low-average to borderline ranges” based on WAIS-R); 21 years old</p>	<p>Vocational and work-related interpersonal skills:          (a) work rate,          (b) task-accuracy          (c) initiating/responding to greetings, stating ‘excuse me’</p>	<p>Supported employment:  <i>Job/skill match/selection</i>: assessments, analyses of assessments, job and company selection  <i>Supportive employment</i>: forward chaining, modelling, feedback, verbal and physical prompting, cue cards, verbal rehearsal, (fading out) physical proximity and social reinforcement, weekly payment</p>	<p><i>Results</i>: Mixed: (a) work rate improved, (b) job-task accuracy improved for 13 of 15 subtasks, and (c) both interpersonal skills improved (changes measured between first five and last five supportive sessions); FU: No; Gen: No; SV: No  <i>Certainty</i>: Suggestive: a pre-experimental, single subject, intervention only design was used, without replications. Insufficient detail on intervention and dependent measures to enable replication. IOA and TF were not reported</p>
<p>Smith Myles et al. (2007)</p>	<p>N = 1/1          1 male (AS); 17 years old</p>	<p>Self-recording of homework assignments in a planner, i.e.,          (a) subject of homework          (b) date assignment was due          (c) details of assignment</p>	<p>Use of handwriting requirements was compared to use of a PDA:  <i>Pre-training</i> (technological use PDA-system): specific instruction  <i>Training</i>: prompts to enter homework in PDA at first day of self-management sessions in each setting</p>	<p><i>Results</i>: Mixed: mastery criterion was reached in 2 settings (following 6 and 8 PDA-sessions, respectively); no changes in third setting (following 5 PDA-sessions) although there was an increasing trend in the last 2 sessions; FU: No; Gen: No; SV: No  <i>Certainty</i>: Preponderant: intervention was staggered over time across 3 settings; in 2 settings skill improvements followed start of intervention; in the baseline of setting 3, generalization could be in effect, limiting control for alternative explanations. TF was not reported, however, participant’s use of the PDA (= intervention) was reported; adequate IOA data</p>
<p>Songlee et al. (2008)</p>	<p>N = 4/ 2          2 males (AS; Full scale IQ: 110 and 140); 17 and 16 years old</p>	<p>Strategic performance on taking tests:          (a) test preparation,          (b) using test instruction</p>	<p>Strategy training:  <i>Strategy-instruction</i>: feedback on pre-test probes, goal setting, instruction conform Test-taking Strategy Instructor’s Manual</p>	<p><i>Results</i>: Positive: mastery criterion was reached for both included participants following strategy training; FU: Yes; Gen: Yes; SV: Yes  <i>Certainty</i>: Preponderant: start of interventions was staggered over time across three out of four participants. Start of intervention for</p>

Tiger et al. (2007)	N = 1/1 1 male (AS); 19 years old	Improving response rate: <i>Study 1</i> : Improving short response latencies in question answering <i>Study 2</i> : Improving short response latencies (and accuracy) in math problem solving	(c) answering questions consisting of concept instruction, modelling using mnemonic devices, verbal practice (rehearsal), prompting <i>Strategy practice</i> : review of strategy steps, corrective and positive feedback, and discussion	the participants $\geq$ 16 years was not staggered over time, gradual improvements following intervention in one of both participants. Results were replicated with two participants who were younger than 16 years of age, limiting evidence for review's age group. Adequate IOA. Scores on TF did not reflect accuracy in procedure, but accuracy in observations of the procedure.
Turner-Brown et al. (2008)	N = 11/11 1 female, 10 males (Autism: $n = 8$ , ASD: $n = 3$ ; Full scale IQ range 84-144); age range 25-55 years	Social functioning, e.g., social appropriateness, showing social interest and affect, applying fluency and clarity in conversations	Cognitive behavioral program: Modified version of the Social Cognition and Interaction Training (SCITT-A): concept instruction, discussion, response identification, role-play, practice, and homework	<i>Results</i> : Negative: following SCITT-A, no improvements were found in role-play performance in both groups and small improvements were found in social self-reports in experimental group; no significant main effects of group or time, or group x time interaction on both skill measures, however, group x time interaction approached significance ( $p < 0.10$ ) on self-reports; FU: No; Gen: No; SV: No <i>Certainty</i> : Suggestive: a quasi-experimental design was used (no randomized group assignments). Limited detail on specific
				<p><i>Results</i>: Positive: short response latency increased following DR, changes in response latency followed changes in DR-conditions</p> <p><i>Study 2</i>: Positive: short response latency and accuracy increased following (contingency changes in) DR</p> <p>FU: No; Gen: Yes; SV: No</p> <p><i>Certainty</i>: Conclusive: different experimental conditions were conducted to reverse the effects of applied contingencies, indicating that the reversing conditions controlled the outcomes. Adequate IOA. Sufficient detail on intervention procedures to enable replication. Although TF was not reported, the 2<sup>nd</sup> study served the same function as TF by providing evidence that gains were due to DR. The second study also provided control for alternative explanations for treatment gains (i.e., type of questions, type of rule instructions)</p>

intervention procedures refrains from replication. Adequate IOA, TF was not reported despite compound procedure

*Results:* Mixed: pre-post data on performance were presented for one skill per participant, showing improvements in skills (c), (d), and (e); *M* pre-post group ( $N = 10$ ) changes show significant increases in 4 out of 5 skills, increase in ‘share ideas’ was not significant; FU: No; Gen: Yes; SV: Yes  
*Certainty:* Suggestive: intervention was staggered over time across 5 skills and 5 participants; this was replicated across 5 other participants, data were collected only on one skill per participant; number of data-points in the baseline of the multiple probe design ranged from 1 to 3, indicating insufficient control on data variability during baseline. Adequate IOA. Insufficient detail on compound procedure refrains from replication, TF was not reported. Authors also reported use of a multiple baseline design across skills in presenting pre-post group means on skills. However, insufficient detail in describing this design refrains from drawing conclusions regarding the level of control for alternative explanations

Social skills instruction program: Strategy program (SCORE Skills, Vernon et al., 1996): concept instruction, task analysis, discussion, modelling, verbal practice (rehearsal), role-play, game activities

Social functioning:  
 (a) share ideas  
 (b) compliment others  
 (c) offer help  
 (d) recommend changes nicely  
 (e) exercise self-control

$N = 10/ 3$   
 3 males (ASD; Full Scale IQ: 85, 107, and 86); 16, 16, and 17 years old, respectively

Webb et al. (2004)

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NB. *N*, Total number of participants in study/ number of participants included in review; PDD-NOS, pervasive developmental disorder not otherwise specified; NR, not reported; FU, follow-up; Gen, generalization; SV, social validity; IOA, inter-observer agreement; TF, treatment fidelity; AS, Asperger’s syndrome; PND, percentage non-overlapping data; HF/A, high-functioning autism; ASD, autism spectrum disorder.

regarding these participants. Eight studies contained 19 participants who did not meet the inclusion criteria regarding age, diagnosis, or IQ. Of these 19 participants, 13 were younger than 16 years (Delano, 2007; Dotson et al., 2010; Koegel & Frea, 1993; Songlee, Miller, Tincani, Sileo, & Perkins, 2008; Webb et al., 2004), one person did not have a diagnosis of ASD (Dotson et al., 2010), and five persons had ID (Allen, Wallace, Greene, Bowen, & Burke, 2010; Allen, Wallace, Renes, Bowen, & Burke, 2010; Mechling, Gast, & Seid, 2009).

Among the 97 included participants, 12 were female (12%) and 85 were male (88%). This male to female ratio is consistent with the more pronounced ratio within that of the ASD population without ID (Fombonne, 2003). The participants in 19 out of the 20 included studies ranged in age from 16 to 55 years old. In one study (Gentry et al., 2010) participants' age ranged from 14 to 18 years, however, the study was included because mean age ( $M = 16.5$  years) met our inclusion criterion (see *Inclusion and exclusion criteria*). Thirty-eight participants were diagnosed with Autism (39%), 21 with AS (22%), and five with PDD-NOS (5%). Furthermore, eight (8%) participants were described as having high-functioning autism (HFA) and/or AS, 10 participants (10%) were described as having Autism or AS, and 15 participants (16%) were identified as having an ASD but a specific diagnosis of Autistic disorder, AS, or PDD-NOS was not stated. Across studies, the reported Full Scale IQ of the included participants ranged from 71 to 144 ( $M = 101$ ).

### *Settings*

The setting was specified in 18 studies. The most often used settings were community locations such as employment settings (e.g., Allen, Wallace, Green, et al., 2010; Hillier, Campbell, et al., 2007), schools (e.g., Davis, Boon, Cihak, & Fore, 2010; Mechling et al., 2009), or public agency settings such as university offices (e.g., Delano, 2007; Dotson et al., 2010). Home locations (Gentry et al., 2010) and day or clinical treatment settings (e.g. Bouxsein, Tiger, & Fisher, 2008; Palmen et al., 2008) were also used. Nine studies made use of multiple locations mostly within the same setting. In seven of these studies different locations were used for training and data collection (Allen, Wallace, Green, et al., 2010; Allen, Wallace, Renes, et al., 2010; Burke, Andersen, Bowen, Howard, & Allen, 2010; Davis et al., 2010; Koegel & Frea, 1993; Palmen et al., 2008; Webb et al., 2004).

### *Targeted adaptive skills*

Across all studies, targeted adaptive skills could be classified into four categories: (a) social interaction skills, (b) academic skills (c) vocational skills, and (d) domestic skills. Studies in

the *social interaction skills category* ( $n = 8$ ) included interventions designed to improve (non-) verbal social interaction skills such as using appropriate distance, eye contact, or voice tone (e.g., Dotson et al., 2010; Koegel & Frea, 1993), initiating and maintaining conversations (Howlin & Yates, 1999), asking and/or answering questions (e.g., Davis et al., 2010; Palmen et al., 2008), delivering positive feedback (e.g., Dotson et al., 2010; Webb et al., 2004), offering help (Webb et al., 2004), or quality of social functioning (Fullerton & Coyne, 1999; Turner-Brown et al., 2008). Studies in the *academic skills category* ( $n = 6$ ) included interventions designed to improve home work planning (Smith Myles, Ferguson, & Hagiwara, 2007), strategic test performance (Songlee et al., 2008), management of every day living tasks (Gentry et al., 2010), task engagement (Bouxsein et al., 2008), written language performance (Delano, 2007), and response latency (Tiger, Bouxsein, & Fisher, 2007). Studies in the *vocational skills category* ( $n = 5$ ) included interventions designed to improve vocational and/or work-related social skills such as transitioning and task completion (Hillier, Campbell, et al., 2007), asking for help (Hillier, Campbell, et al., 2007), task-accuracy (Shields-Wolfe & Gallagher, 1992), accurate greeting/saying goodbye (Hillier, Campbell, et al., 2007; Shields-Wolfe & Gallagher, 1992), or multiple product promotion tasks in a mascot job (WalkAround® mascot; Signs & Shapes International, Inc. Omaha, NE, USA) (Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Burke et al., 2010). Finally, one study was categorized as *domestic skills*. In that study interventions were designed to improve the completion of cooking recipes (Mechling et al., 2009). See Table 1 for further information on targeted skills.

#### *Data collection and interobserver agreement*

Data on targeted skills were mostly collected by direct observation. For example, social skill interactions were measured between the participant and a non-disabled peer or an adult (Davis et al., 2010; Koegel & Frea, 1993; Palmen et al., 2008) or during role-play scenarios with the trainer (e.g., Dotson et al., 2010; Turner-Brown et al., 2008; Webb et al., 2004). Direct observations of targeted academic, vocational, and domestic skills were mostly conducted in the training setting of the study or in an incidental job setting; however, Shields-Wolfe and Gallagher (1992) and Smith Myles et al. (2007) collected data in regular settings (i.e., regular employment setting and regular classes, respectively). Next to direct observation, self-report measures (Turner-Brown et al., 2008) and (semi-) structured interviews (Fullerton & Coyne, 1999; Gentry et al., 2010) were used. In one study (Hillier, Campbell, et al., 2007) data were collected using questionnaires completed by a relative (i.e., participant's supervisor).

In 17 studies (85%) data were collected on interobserver agreement (IOA) in at least 20% of the assessment sessions. Mean agreement scores ranged from 87 to 100% (Kappa's were not reported) and one study reported an adequate Chronbach's alpha of 0.7 (Turner-Brown et al., 2008). The studies that targeted on task management at home (Gentry et al., 2010) and vocational skills in the regular job setting (i.e., Hillier, Campbell, et al., 2007; Shields-Wolfe & Gallagher, 1992) did not report data on IOA.

### *Intervention procedures*

A variety of intervention procedures were used by the studies in the *social interaction skills* category. Six out of the eight studies used a group format in teaching social interaction skills. The group size ranged from 3 (Palmen et al., 2008) to 11 participants (Howlin & Yates, 1999; Webb et al., 2004). In these studies the therapist conducted some combination of the following procedures: concept instruction (in general consisting of describing the skills, providing a rationale for using them, providing guidelines in using the skills, and discussing skill steps), task analyses, response identification/discrimination, modelling, (video-taped) role-play practice, and feedback (see Table 1).

Five studies involved role playing a simulated situation by participants (Dotson et al., 2010; Fullerton & Coyne, 1999; Howlin & Yates, 1999; Turner-Brown et al., 2008; Webb et al., 2004). During role-play in the study of Palmen et al. (2008), the trainer provided the participant with a response opportunity by presenting a discriminative stimulus (i.e., 5 s silence cue) and the participant used a flowchart for self-instruction. Several studies also used game activities or homework assignments in practicing the skills (e.g., Howlin & Yates, 1999; Turner-Brown et al., 2008). Feedback consisted of descriptive feedback (i.e., explaining why a response is [in] correct) (Davis et al., 2010; Howlin & Yates, 1999; Webb et al., 2004), positive reinforcement and corrective feedback using a prompting procedure (Dotson et al., 2010; Palmen et al., 2008), and self-reflection (Fullerton & Coyne, 1999). Most studies used praise in providing positive feedback or reinforcement; the additional use of tangible rewards for correct responding was reported only by Palmen et al. (2008). Two studies used available social skills programs. Turner-Brown et al. (2008) used a modified version of the Social Cognition and Interaction Training (SCITT), a group-based cognitive behavioral intervention originally designed for adults with psychotic disorders (Penn, Roberts, Combs, & Sterne, 2007) and Webb et al. (2004) used the SCORE Skills Strategy program, a program validated for students with learning disabilities (Vernon, Schumaker, & Deshler, 1996). Davis et al. (2010) compared the effects of a regular conversational group training ( $n = 3$ ) with the effects



of an additional power card strategy training consisting of a one-to-one instructional format session and practice sessions with a non-disabled peer. Koegel and Frea (1993) used a self-management procedure consisting of self-recording and self-reinforcement. Following a one-to-one pre-treatment session, practice sessions were conducted with a non-disabled adult. All studies provided information on intervention density regarding the length and/or the number of sessions, and/or the total length of the intervention period (in weeks or months). Length of sessions ranged from 5-min sessions (four to seven during one day per week) (Koegel & Frea, 1993) to 2-3-h sessions per week (Fullerton & Coyne, 1999) or per month (Howlin & Yates, 1999). The total length of the intervention period ranged from 6 weeks with weekly 50-min sessions (Palmen et al., 2008) to one year with monthly sessions (Howlin & Yates, 1999). In two studies (Davis et al., 2010; Dotson et al., 2010) a mastery criterion was defined in finishing an intervention. The total length of the intervention period was about 12 weeks in the study of Dotson et al. (2010) In the study of Davis et al. (2010) each participant needed five daily 15-min probe sessions to reach criterion; however, no information was reported on the length of conversational pre-training.

All six studies in the *academic skills* category used a one-to-one format. In three studies a technology assisted, self-management training was used. Delano (2007) conducted an available strategy instruction program (the Self-regulated strategy development model; Graham, Harris, MacArthur, & Schwarz, 1991) which was delivered by video self-modelling, Gentry et al. (2010) combined several procedures (e.g., stepwise instruction, modelling, rehearsal) to teach the use of a personal digital assistant (PDA) in independent task management, and Smith Myles et al. (2007) compared the use of handwriting requirements with the use of a PDA system in self-recording homework assignments. Songlee et al. (2008) conducted an available strategy instruction program (the Test-Taking Strategy; Hughes, Schumaker, Deshler, & Mercer, 2002) using mnemonic devices and strategy practice. Finally, Bouxsein et al. (2008) compared general and specific verbal task instruction and Tiger et al. (2007) compared the differential effects of differential reinforcement combined with verbal rule instruction. In four studies a mastery criterion was defined in finishing an intervention. The length and number of sessions needed to reach criterion varied from 4, 6- to 21-min sessions (Delano, 2007) to 21, 15-min sessions (Bouxsein et al., 2008), and from 5 to 8 education class sessions (Smith Myles et al., 2007) to 9, 50-min sessions (Songlee et al., 2008). In the study of Tiger et al. number and length of training sessions varied from 17, 10-trial sessions in study 1 to 19, 9-trial sessions in study 2. Gentry et al. conducted one 90-min and three 60-min training sessions in a period from 10 to 14 days, per participant. Training

was followed by an 8-week post-training period in which the investigator could be contacted by email or phone.

All five studies in the *vocational skills* category used a one-to-one format. In the studies of Allen, Wallace, Greene, et al. (2010) and Allen, Wallace, Renes, et al. (2010) general instruction was compared to video modelling in teaching eight mascot job tasks. Baseline and intervention conditions were completed in one day. A mastery criterion was used in evaluating data (minute-by-minute analyses). The two studies differed from each other in that Allen, Wallace, Renes, et al. repeated video modelling when mastery criterion was not reached within a 10-min session following first video viewing, while Allen, Wallace, Greene, et al. conducted video modelling only once and video viewing was followed by only one session with a length of 15-16 minutes. Burke et al. (2010) targeted on 63 mascot job tasks and general instruction was compared to behavioral skills training (BST) (consisting of several procedures such as instruction, video-modelling, practice, feedback, and homework) and a performance cue system (PCS) in which text cues were displayed on an iPod. A mastery criterion was used in evaluating outcomes and two to six 1-h sessions were needed to reach criterion. In the other two studies the intervention consisted of supported employment. In the study by Shields-Wolfe and Gallagher (1992) several behavioral procedures (e.g., forward chaining, modelling, cue cards, and feedback) were used. Support sessions were conducted during 25 days in an 8-week period and lasted 3-4 hours per session. Although precise information is not reported, Hillier, Campbell, et al. (2007) used several means in supporting employment such as “help” with training, providing conversation topics, training in job tasks (when necessary) and psycho education of employers and co-workers. The amount of support ranged from 4 to 20 h per week until independency in job position (i.e., ranging from 1 day to 6 months). Next to this, follow-on support was conducted consisting of evaluations and support in case of problems and was faded from twice a week to once a month; the duration of the investigation was 2 years. In both studies, supported employment was preceded by a pre-placement program consisting of skill assessments and job selection. In the study of Shields-Wolfe and Gallagher, pre-training consisted of 20 sessions during an 8-week period. Hillier, Campbell, et al. conducted pre-training during at least 1 h per week until a job was found (i.e., ranging from 1 to 8 months).

Finally, in the only one study on *domestic skills* (Mechling et al., 2009), a one-to-one format was applied and training was conducted once a day, 3-4 days a week until mastery criterion (i.e., ranging from three to six sessions). A technology assisted self-management procedure was used consisting of self-prompting using a PDA. The PDA contained task

analyses and a least to most prompting strategy. Self-management training consisted of specific praise and corrective feedback. The intervention contained a pre-training phase in which the participant was trained in the technical use of the tool. The pre-training phase lasted until mastery criterion; its length was not reported.

### *Treatment fidelity*

Across all studies, only four studies (20%) used procedures to assess accuracy of implementation of treatment procedures. Mean treatment fidelity (TF) scores ranged from 95% to 100% (Davis et al., 2010; Dotson et al., 2010; Mechling et al., 2009; Songlee et al., 2008). However, the TF measure used in the study by Songlee et al. (2008) did not reflect the accuracy in the procedure as agreement between observers was calculated on steps (in-) completed by the trainer. In some studies in which no TF scores were reported, other procedural aspects provided (at least partially) control for variations in implementation of procedures. For example, in the studies of Koegel and Frea (1993), Smith Myles et al. (2007) and Gentry et al. (2010) participants' use of self-management tools (i.e., self-recording equipment and PDA's) was reported indicating control for treatment implementation and in the study of Palmen et al. (2008) the trainer used a flowchart of the procedure to control for variations in treatment.

### *Study designs*

In 15 studies (75%) some variant of the single-subject design (Horner et al., 2005) was used to evaluate the effects of the intervention. In one single-case study, a pre-experimental (intervention-only sequences) design was used (Shields-Wolfe & Gallagher, 1992). In the other 14 studies, the design could be classified as true-experimental in that a systematic introduction and removal of the intervention was conducted using a reversal design (Tiger et al., 2007) or that a staggered introduction of intervention was conducted using a multiple baseline or multiple probe design across (groups of) participants (e.g., Allen, Wallace, Greene, et al., 2010; Palmen et al., 2008), across tasks or settings (e.g., Mechling et al., 2009; Smith Myles et al., 2007), across skills (Delano, 2007; Dotson et al., 2010), or across participants and skills (Koegel & Frea, 1993; Webb et al., 2004). Combinations of designs were also used, for example Bouxsein et al. (2008) combined a multiple baseline design with a changing criterion design and Webb et al. (2004) combined a multiple baseline with a multiple probe design, although the multiple baseline design could not be discerned from their description.

In five studies a variant of the group research design (Gersten et al., 2005) was used. The designs of four studies could be classified as pre-experimental in that they involved pre-post, no control group designs (Fullerton & Coyne, 1999; Gentry et al., 2010; Howlin & Yates, 1999) or intervention-only sequences (Hillier, Campbell, et al., 2007). Turner-Brown et al. (2008) used a pre-post control group design. However, group assignment was not randomized, indicating a quasi-experimental design was used.

### *Outcomes*

Thirteen studies (65%) reported positive outcomes (Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Bouxsein et al., 2008; Burke et al., 2010; Davis et al. 2010; Delano, 2007; Fullerton & Coyne, 1999; Gentry et al., 2010; Koegel & Frea, 1993; Mechling et al., 2009; Palmen et al., 2008; Songlee et al., 2008; Tiger et al., 2007). Mixed outcomes (improvements in some but not all adaptive skills) were reported in six studies (Dotson et al., 2010; Hillier, Campbell, et al., 2007; Howlin & Yates, 1999; Shields-Wolfe & Gallagher, 1992; Smith Myles et al., 2007; Webb et al., 2004). Negative outcomes were found by Turner-Brown et al. (2008); comparison of pre-post group means on two measures did not show statistically significant improvements following intervention. See Table 1 for further information on outcomes.

### *Follow-up and generalization*

Eight studies (40%) included data on follow-up. In six of these studies the maximum length of the follow-up period ranged from 1 week to 1 month following intervention and data were collected using direct observation (Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Burke et al., 2010; Mechling et al., 2009; Palmen et al., 2008; Songlee et al., 2008). In two studies, maintenance probes were also conducted at 14 weeks (Delano, 2007) or 3 months (Dotson et al., 2010) following intervention. Most studies reported successful maintenance of targeted skills within a month following intervention. At a longer term, decreases were found; however, outcomes stayed above baseline levels. Although Fullerton and Coyne (1999) reported that post-intervention data were collected 8 to 10 weeks following intervention using structured parent interviews, specific data could not be discerned from their description.

Generalization effects of intervention were measured in 11 studies (55%). In eight studies data were collected using pre-post measures in participants themselves. Generalization was measured across types of task stimuli (Delano, 2007; Fullerton & Coyne, 1999; Songlee

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et al., 2008; Tiger et al., 2007), across settings and/or conversation partners (Davis et al., 2010; Dotson et al., 2010; Koegel & Frea, 1993; Palmen et al., 2008), and across skills (Koegel & Frea, 1993). Five studies reported positive outcomes, and mixed results were found by Davis et al. (2010), Fullerton and Coyne (1999), and Dotson et al. (2010). In the studies of Fullerton and Coyne (1999) and Webb et al. (2004) generalization across settings was measured using pre-post ratings by parents. Fullerton and Coyne found mixed outcomes and Webb et al. found no statistically significant increases. Only post-measures were used by Allen, Wallace, Greene, et al. (2010) and Burke et al. (2010) in evaluating generalization across job settings and across persons (i.e., other audience), respectively; both studies reported positive outcomes.

### *Social validity*

In 11 studies (55%) systematic measures of social validity were conducted following intervention. In 10 studies a questionnaire or checklist was used that was completed by participants only (Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Hillier, Campbell, et al., 2007) or by participants and related persons such as conversation partners, classmates and/or parents (Burke et al., 2010; Davis et al., 2010; Gentry et al., 2010; Howlin & Yates, 1999; Palmen et al., 2008; Songlee et al., 2008; Webb et al., 2004). Questionnaires consisted of items rating skill improvements and/or satisfaction with the learned skill, the intervention procedures, or overall program. Across studies, most participants as well as relatives were positive about the outcomes and were satisfied with the learned skill and procedures used, although mixed outcomes were also found in which positive ratings by participants were not fully supported by parents' ratings or vice versa (i.e., Davis et al., 2010; Webb et al., 2004). In the study by Mechling et al. (2009), participants were asked only one question following intervention assessing their preferred prompting system: included participant preferred a DVD-player to the PDA (despite its positive effects), because of DVD's possibility to watch movies.

### *Certainty of evidence*

Five studies were rated as providing a conclusive level of certainty of evidence. Two of these studies targeted on social interaction skills (Dotson et al., 2010; Palmen et al., 2008), another two studies targeted on academic skills (Bouxsein et al., 2008; Tiger et al., 2007), and the study in the domestic skills category was also rated as conclusive (Mechling et al., 2009). All studies provided positive intervention outcomes, except Dotson et al. (2010) (i.e., mixed, see

Table 1). All studies used a true experimental design and provided at least some control for alternative explanations and reported accurate interobserver agreement, operational definitions of dependent measures and sufficient detail on intervention to enable replication. Next to this, all studies provided (at least partially) control on treatment implementation in reporting treatment fidelity (Dotson et al., 2010; Mechling et al., 2009) or in using procedural aspects that limited variations in implementation of procedures.

Seven studies were rated as providing a preponderant level of certainty of evidence (Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Davis et al., 2010; Delano, 2007; Koegel & Frea, 1993; Smith Myles et al., 2007; Songlee et al., 2008). All studies provided positive intervention outcomes, except Smith Myles et al. (2007) (i.e., mixed, see Table1). Preponderant ratings were mainly assigned due to limited control for alternative explanations for treatment outcomes.

Eight studies were classified as providing a suggestive level of certainty of evidence. Three of these studies provided positive intervention outcomes (Burke et al., 2010; Fullerton & Coyne, 1999; Gentry et al., 2010). The others provided mixed outcomes except Turner-Brown et al. (2008) (i.e., negative). In six studies, suggestive ratings were due to reliance on pre- or quasi-experimental designs (Fullerton & Coyne, 1999; Gentry et al., 2010; Hillier, Campbell, et al., 2007; Howlin & Yates, 1999; Shields-Wolfe & Gallagher, 1992; Turner-Brown et al., 2008). Although Burke et al. (2010) and Webb et al. (2004) used true experimental designs, studies were classified as suggestive because detail on the procedure was insufficient to enable replication and TF was not reported despite the use of compound procedures. See Table 1 for the specific reasons each study was rated at a certain level.

## **Discussion**

Our systematic review summarized 20 studies involving behavioral interventions to improve the adaptive skills of young adults with high functioning ASD. Despite the increase in amount of research on behavioral treatment with persons with ASD (see Matson, Turygin, et al., 2012), there is still a paucity of intervention studies targeting adaptive skills in adults (Matson, Hattier, et al., 2012). However, in this review 16 of the 20 studies (80%) were published after January 2000 and six studies (38%) were published as of January 2010, suggesting that this topic is being given more attention. Almost all studies ( $n = 19$ ) reported improvements in adaptive skills and 12 of these studies (63%) were rated as providing a conclusive ( $n = 5$ ) or preponderant ( $n = 7$ ) level of certainty of evidence. However, a limitation is that six studies (including the one with negative outcomes) used designs that

could only provide a suggestive level of certainty of evidence and two studies provided insufficient detail on the procedure and lacked measures on TF which also resulted in a suggestive level of certainty, despite their true experimental designs. Overall, it may be concluded that a fair amount of evidence exists indicating that behavioral interventions can be successfully used to improve adaptive skills in young adults with high functioning ASD. However, future research involving true experimental designs and methodological transparency are still warranted.

In terms of our aim to provide recommendations for practitioners and to outline directions for future research, several important points do emerge. First, the use of technology assisted procedures seems promising in adaptive skill building in high-functioning young adults with ASD. In general, these procedures may make individuals less dependent on adult prompts and treatment contingencies and the procedures may be considered as a cognitive aid (Gentry et al., 2010) in executive function-related skills (e.g., organization, planning, and goal-direction). However, studies in this area should explicitly focus on fading prompts in using tech devices (e.g., Mechling et al., 2009) as persons may remain dependent on supervisor prompts (e.g., Davis et al., 2010; Gentry et al., 2010). Furthermore, intervention approaches consisting of specific instruction and differential reinforcement contingencies seem to be promising for improving task engagement and response rate and could be considered as a component of supported employment. Finally, interventions on social skill building utilizing multifaceted procedures containing corrective feedback seem to be more promising than traditional SSTGs using descriptive feedback; however, this preliminary conclusion should be interpreted with caution as more methodological robustness is needed in studies on traditional SSTG approaches.

In addition, there are a number of gaps in reviewed studies that need further research. For example, 9 of the 20 studies contained only one or two participants who did meet the inclusion criteria of our review, indicating that replications are necessary to improve generalizability of their conclusions (Horner et al., 2005). Furthermore, the range of focus of studies on daily living skills should be broadened as for example three of the five studies on vocational skills targeted on one specific job (mascot job) and not one study focused on improving leisure skills despite the problems in this area among adolescents and adults with ASD (e.g., Orsmond et al., 2004). Next to this, given the relatively high rate of unemployment in adults with high-functioning ASD, there is a need for more methodological rigor and transparency in studies on supported employment as the studies on this approach were strongly limited in these features. Also, all group design studies lacked a control group

or failed to randomize. As it may be difficult to match groups and use randomization given the differentiations in the characteristics of the disorder in clinical practice, the use of multiple baseline designs across groups of participants (e.g., Palmén et al., 2008) may be an alternative to include more participants and improve certainty.

Finally, although data were mostly collected by direct observation, data collection in natural settings was limited. Next to this, data on generalization were mostly collected within the location of the training albeit in another room. Given the problems in the area of transfer of skills from acquisition in the treatment setting to performance in the natural living setting, the collection of data in natural settings should be the focus of future research and generalization should be explicitly programmed in intervention procedures. Another point of concern in case of generalization refers to maintenance of skills over time as only two studies collected data at 3-month probes following intervention. Although skill performance stayed above baseline levels, decreases in skill performance were the rule rather than the exception, indicating that for long-term maintenance of skills additional measures should be taken (e.g., booster sessions, longer intervention periods, or fading out intervention).

In summary, this review reveals that behavioral interventions in adaptive skill building are encouraging for young adults with high-functioning ASD and should be an explicit component of intervention programs aimed at improving independent functioning.

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## **Chapter 3**

### **Improving question asking in high-functioning adolescents with autism spectrum disorders: Effectiveness of small-group training**

Palmen, A., Didden, R., & Arts, M.

*Autism*, 12, 83-98 (2008).



**Abstract**

Small-group training consisting of feedback and self-management was effective in improving question-asking skills during tutorial conversations in nine high-functioning adolescents with autism spectrum disorder. Training was implemented in a therapy room and lasted 6 weeks. Sessions were conducted once a week and lasted about an hour. Experimenters collected data during tutorial conversations in a natural setting. Training of question-asking skills consisted of verbal feedback and role-play during short simulated conversations and a table game. A self-management strategy and common stimuli (e.g., flowchart) were included to promote generalization. Mean percentage of correct questions during tutorial conversations improved significantly after training. Response efficiency also increased. Participants and personal coaches evaluated the training as effective and acceptable.

**Improving question asking in high-functioning adolescents with autism spectrum disorders: Effectiveness of small-group training**

Deficits in social and communicative skills are characteristic of persons with autism spectrum disorder (ASD) (Koegel, 1996). Impairments manifest especially in conversational discourse, in the use of social interactive skills including joint attention behavior, initiating and maintaining conversations, topic management and turn taking (Fine, Bartolucci, Szatmari, & Ginsberg, 1994; Minshew, Goldstein, & Siegel, 1995; Prizant, Schuler, Wetherby, & Rydell, 1997; Tager-Flusberg & Anderson, 1991; Twachtman-Cullen, 1998; Warreyn, Roeyers, Van Wetswinkel, & De Groote, 2007). Problems in conversational discourse are universal among children and adults with autism. For example, Hale and Tager-Flusberg (2005a) found that the inability to maintain an ongoing topic is significantly related to the overall symptomatology of the autism spectrum disorder and is a significant independent predictor of impairments in communication.

A *discourse deficit* often targeted for intervention is the absence or infrequent occurrence of self-initiated conversations in persons with ASD (e.g., Hauck, Fein, Waterhouse, & Feinstein, 1995; Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996; Newman & Ten Eyck, 2005). Question asking is an initiation skill which makes it possible to arrange interactions, to come into contact with a wide range of social reinforcers and activities, and to acquire novel information, and it may enhance independent functioning (Newman & Ten Eyck, 2005; Taylor & Harris, 1995; Weiss & Harris, 2001). Impairments in the ability of question asking are a distinctive deficit of individuals with autism, and interventions for improving this ability are therefore especially recommended for persons with autism (Koegel, 1996; Matson et al., 1996; Weiss & Harris, 2001).

Most studies in the area of teaching question asking have been conducted with children with ASD (e.g., Charlop-Christy & Kelso, 2003; Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Oke & Schreibman, 1990; Taylor & Harris, 1995). Effective treatment packages consisted of behavior analytic techniques, such as stimulus cue cards, modelling, prompt fading, feedback, guided practice, and role-play, implemented in one-to-one teaching formats. Several investigators have used visual cues to promote initiations and cross-setting generalization of interaction skills. For example, Charlop and Milstein (1989) used conversational scripts in teaching three 6 to 8-year-old children with ASD to ask questions in the context of a conversation. After implementation of a video-modelling procedure there was a substantial increase in the number of appropriate questions asked.

Krantz and McClannahan (1993) successfully used written scripts and a script fading procedure in teaching peer initiations in four children with ASD. Conversational scripts, presented on cue cards, were also effective in the study by Charlop-Christy and Kelso (2003) in teaching conversational speech (including question asking) to three verbal, literate children with ASD. In all studies social initiations generalized across topics, persons and rooms, albeit in the training location. In the study of Secan, Egel, and Tilley (1989) a picture training strategy, including modelling and reinforcement, was effective in teaching four children with ASD (5-9 years) generalized responses to 'Why', 'How' and 'What' questions with a *visible* referent. The study of Koegel et al. (1998) is noteworthy because of the successful setting generalization of the spontaneous use of question asking in three children with ASD. Training took place in a clinic room. Generalization data were collected at home during play interactions using a multiple baseline design across participants. Silence cues, modelling and reinforcement were used to teach the children the self-initiated questions 'What's that?'. The setting generalization may be the result of the use of motivational components as preferred items, providing choices, natural reinforcers, and multiple exemplars (Stokes & Osnes, 1989) in combination with the low complexity of the particular question.

In the small number of studies with adolescents and young adults with ASD, teaching question asking was part of a general social skills teaching program targeted on a range of skills (Howlin & Yates, 1999; McGee, Krantz, & McClannahan, 1984; Mesibov, 1984; Webb, Miller, Pierce, Strawser, & Jones, 2004). Treatment packages consisted of behavioral techniques in combination with group discussions and format. For example, Howlin and Yates (1999) used role-play, structured games, team activities and feedback in improving social skills, including question asking, in 10 high-functioning adults with ASD. Video recordings of simulated social activities, made at the beginning and end of the year's program, showed significant increases in maintaining and initiating conversations but not in requesting information. Data on checklists, completed by the participants and their families at the end of the year, showed improvements in several conversational and social skills. Because of the lack of methodological control, apparent improvements cannot be attributed to the effects of the program. Webb et al. (2004) used table games, instruction, modelling, and role-play in teaching five social interactive skills, including question asking, to 10 high-functioning adolescents with ASD. A multiple-baseline-across-skills design was used to assess the participants' entry level and acquisition of the five skills in role-play situations. Results indicated that there were significant gains in all skills, except 'share ideas'. Data on knowledge rating-scales, completed by the participants, showed that their knowledge of the

five skills also improved substantially. However, parents' ratings on the social competence of their adolescent, pre- and post- intervention, showed no substantial gains in the performance of social skills in the home setting. Lack of experimental control and data on interrater reliability, and failure to show improvement in social skills in natural settings limit the validity of the conclusions of some of these studies. The failure to observe generalization may be explained by the lack of programming generalization since explicit programming of generalization is necessary (Griffiths, Feldman, & Tough et al., 1997; Koegel et al., 1998). Another explanation may be that the skills rating systems used for measuring generalization were not sensitive enough to measure changes in dependent variables. In measuring generalization of skills to natural settings, experimenters should unobtrusively observe the person's interactions in the natural environment and document pre- to post- training improvements (Hansen, Watson-Perczel, & Christopher, 1989b; Koegel et al., 1998; Rogers, 2000). Therefore, the present study aimed to improve question asking during tutorial conversations in nine high functioning adolescents with ASD and to promote generalization across settings using common stimuli and self-management procedures (Koegel, Koegel, & Parks, 1996; Stokes & Osnes, 1989).

## **Method**

### *Participants*

Nine high-functioning adolescents with ASD participated. They were diagnosed by a licensed psychiatrist according to DSM-IV criteria for autism spectrum disorders. All participants were clients of a treatment facility serving individuals with ASD. Participants were between 17 and 25 years old, and seven of them were male. Table 1 depicts the demographic characteristics of the participants. Individuals were selected by their staff. Inclusion criteria were: (1) individual has a full-scale IQ higher than 70 on a verbal intelligence scale; (2) individual is at least 16 years old; (3) individual has problems initiating questions during the tutorial conversations with his or her personal coach; and (4) individual speaks in complete sentences, measured by the communication subscale of the VABS. Individuals and personal coaches participated on a voluntary basis and informed consent was obtained for each participant prior to the start of this study.

### *Setting*

All baseline and training sessions were conducted in a specific location, a 4 x 4m therapy

**Table 1.** Demographic characteristics of participants.

P	Gender	Age (years)	IQ <sup>a, b</sup>	Verbal IQ	Performance IQ	Comm. MA <sup>c</sup> (years; months)
Dick	M	25	126	130	116	12;6
Tom	M	23	131	131	124	10;4
Kees	M	17	110	104	114	7;1
Rob	M	18	90	96	85	7;9
Linda	F	20	119	108	130	8;3
Piet	M	18	111	101	120	7;4
Sarah	F	24	–	89 <sup>a</sup>	58 <sup>a</sup>	5;11
Jan	M	17	80	82	82	7;9
Klaas	M	17	100	91	112	7;4

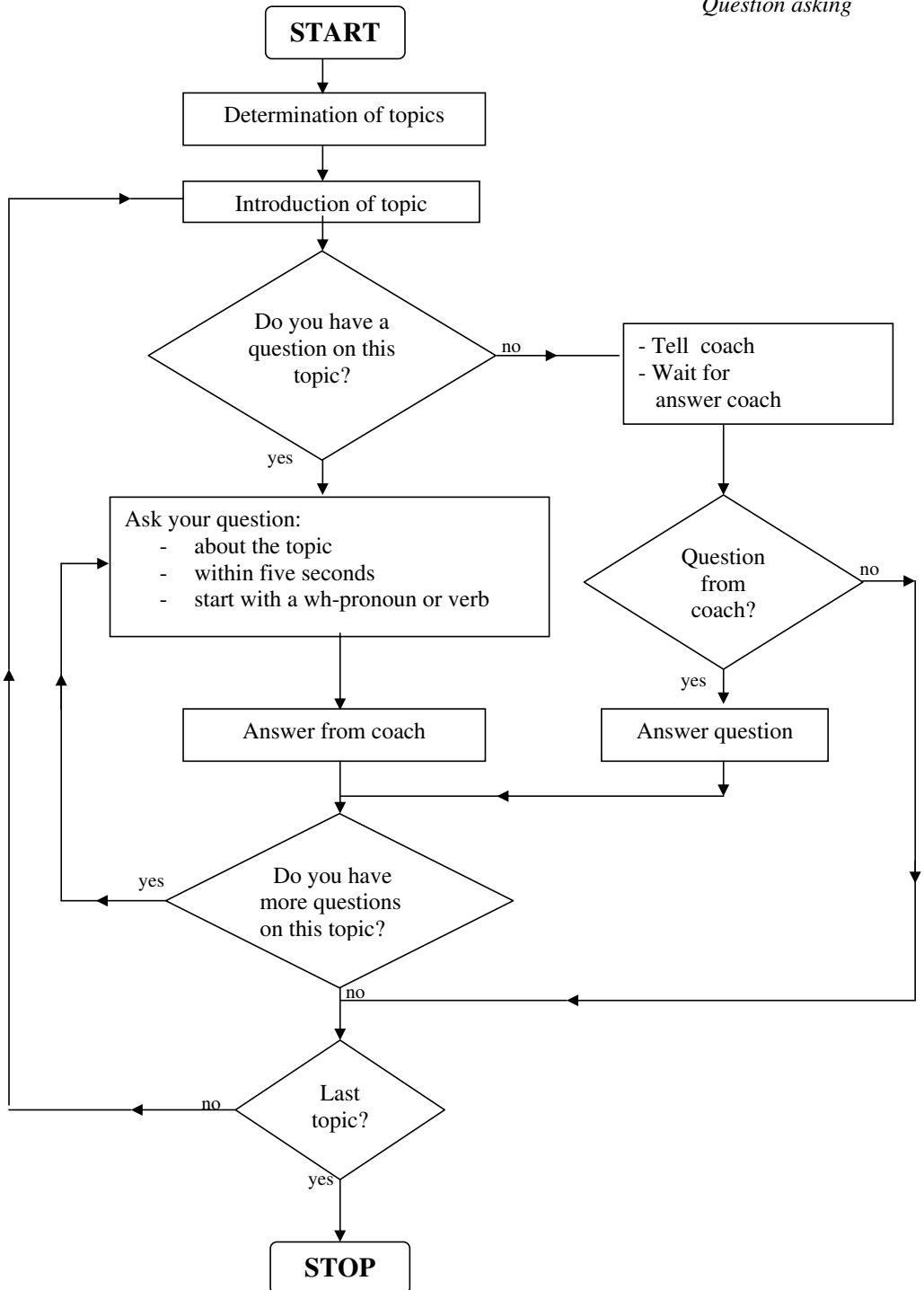
NB. P, participant; Comm. MA, communication mental age; –, not available.

<sup>a</sup> WISC-r; <sup>b</sup> WAIS; <sup>c</sup> Vineland Adaptive Behavior Scales.

room. Participants and trainer sat at a table that was positioned in the centre of the room. Data on question asking were collected during the natural tutorial conversations between the participant and his or her personal coach. These conversations were held in the setting in which the participant always held his or her tutorial conversations (i.e., generalization setting). This setting could be the coach's office, the participant's bedroom or living room, or another meeting room. Tutorial conversations occurred once a week and their purpose was to offer the participants opportunities to ask for help and support. During these conversations, events that had occurred during the past week were discussed and appointments were made for the next week. Also, participants' educational goals, such as how to use a diary, were discussed and evaluated.

### *Materials*

A flowchart was used depicting a strategy for asking a correct question during a conversation (see Figure 1). The flowchart was intended to serve as a visual cue to facilitate self-management (see Krantz & McClannahan, 1993) and as a common stimulus to facilitate across setting generalization (see Stokes & Osnes, 1989).



**Figure 1.** Flowchart of question asking during tutorial conversations.

During training, audio-taped simulated conversations were used. Also, the three criteria for a correct question were printed in black on white paper (210 x 297mm). Underneath each criterion, two boxes (110mm x 60mm) were depicted, containing the words 'correct' or 'incorrect'. Furthermore, a table game was used in evaluating the role-play: each participant had a board (210 x 297mm) on which 50 boxes were depicted, in a sequence numbered from 1 ('start' box) to 50 ('finish' box). A pawn was placed in the 'start box'. Participants could earn points by correct question asking during role-play or correct evaluating of the role-play of other participants. Finally, during role-play the trainer used a flowchart on which the guidelines of the procedure were depicted.

### *Recording*

Tutorial conversations between the participant and his or her personal coach were audiotaped. A continuous partial 20 s interval recording procedure was used for recording. Each interval was recorded with respect to the presence (+) or absence (-) of each of the following categories: (1) a question is asked within the 5 s silence interval presented by the coach; (2) the question is related to the topic of the conversation; (3) the question began with an interrogative, such as 'who', 'what', or 'when', combined with a preposition (e.g., "With whom...?"), or a name (e.g., "John, when...?") or began with a verb (e.g., "Do you...?"); and (4) there was a 5 s silence interval.

### *Dependent measures*

There were two dependent variables: (1) percentage of correct questions during a tutorial conversation, and (2) response efficiency. A question was scored as correct if it (1) was asked within the 5 s silence interval, (2) was related to the topic of conversation, and (3) began with an interrogative or a verb. A question was scored as incorrect if the participant failed on at least one of the three criteria.

The percentage of correct questions was calculated by dividing the number of intervals with a correct question by the number of intervals with a correct and incorrect question plus the number of intervals with a 5 s silence interval, multiplied by 100%. This outcome reflects the proportion of the number of correct questions and the number of opportunities for the participant to ask a question. To correct for the number of opportunities that each participant had for asking a question, a weighted percentage was calculated. Response efficiency was calculated by dividing the number of intervals with a correct question by the number of intervals with correct and incorrect questions, multiplied by 100%. Response efficiency

reflects the proportion of number of correct questions and the total number of questions asked.

### *Design*

Data were collected in a non-concurrent multiple baseline design across three groups, and each group consisted of three participants (Watson & Workman, 1981). Baseline, intervention, and follow-up were in effect for respectively 3 to 6 weeks, 6 weeks, and 1 to 3 weeks. During all phases of the study, participants did not receive training aimed at improving question asking apart from the training given in the present study. Follow-up data were collected after 1 month.

### *Reliability of recording*

During pre-baseline, a secondary observer received instruction on the criteria of correct questions and procedure of recording. Furthermore, 15 min fragments of tutorial conversations were recorded. Interrater reliability was assessed on an interval-by-interval basis and calculated by dividing the number of agreements by the number of agreements and disagreements, multiplied by 100%. Baseline data collection did not begin until at least 85% interrater agreement had been attained during pre-baseline.

Reliability checks were conducted during 20% of all recording sessions and were approximately equally distributed across participants and conditions of baseline and intervention. Throughout the study, the secondary observer was never told the reliability data. Reliability was 96.3% (range 93–100%).

### *Procedure*

*Pre-baseline.* Prior to baseline, a tape recorder was used during tutorial conversations to control for the reactive effects of audio-taping. Personal coaches were informed about the aim of the study and were instructed to: (1) schedule a conversation with the participant once per week that contained at least five topics; (2) ask the participant to list topics at the beginning of the conversation; and (3) to use a 5 s silence interval after the introduction of each topic and at regular intervals during the conversation.

*Baseline.* The same instructions as pre-baseline were given to the personal coaches. Two weeks prior to the start of treatment, the trainer held weekly 1-hour sessions with the three groups of participants to control for the reactive effects of increased attention. During the sessions, conversations were held about general topics. No training principles were in effect.



*Training.* Training sessions were held once per week and lasted about 1 hour. Three individuals and the trainer participated. Each session consisted of three parts: (1) introduction, (2) evaluation of simulated conversations, and (3) role-play.

During *the 10 minute introduction* the aim of the training was explained to the participants. The importance of asking correct questions was reviewed. The three criteria for a correct question were introduced using the sheet and the trainer provided several examples of each criterion.

During *evaluation of simulated conversations* the participants were presented with audiotaped simulated conversations between a man and a woman. Each short conversation had a fixed order and contained three elements: (1) a topic is broached, (2) a question is asked, and (3) an answer to that question is given. For example: "Next weekend, you will visit your parents because of your dad's birthday. It would be a nice idea to give him a small present." (topic); "Could you help me decide what to buy for him?" (question, correct); "OK, let's go to the store tomorrow and have a look at items that your dad would like to get." (answer). The trainer modelled the evaluation procedure by presenting several examples of audiotaped correct and incorrect questions. Following each example, the trainer explained which question was correct and which was incorrect. The participants evaluated five audiotaped conversations. To evaluate these conversations, each participant used three pawns and a sheet (see *Materials*). The trainer started the audiotape, and a short conversation was presented. Following the conversation, the trainer stopped the tape and instructed participants to evaluate the question by placing a pawn in one of the two boxes (i.e., a box named 'correct' and a box named 'incorrect') depicted underneath each criterion on the sheet. After 10 s had elapsed, the trainer provided feedback to each participant concerning his or her (in)correct evaluation of each criterion. In case of disagreement between trainer and participant, the audiotape was rewound and the conversation was replayed.

During *role-play* each participant took part in five role-play exercises with the trainer. Preceding role-play, each participant received a flowchart depicting guidelines for asking a correct question (see Figure 1). The purpose of the role-play was explained using the flowchart. Then, participants were asked to name topics that could be used during role-play and they were instructed to use the flowchart. Finally, participants were informed about the rules of the table game (see *Materials*).

The order in which participants took turns in the role-play exercise was randomized. During role-play, the trainer played the role of the personal coach, introduced topics of conversation, and presented opportunities to ask questions using 5 s silence intervals.

Role-play started with the trainer calling the name of the participant and introducing a topic. An audio tape-recorder was started, and the trainer began the conversation and used a 5 s silence interval to provide the participant with an opportunity for question asking. In cases of a question, the question was answered by the trainer and the role-play was finished. In cases of no question, the role-play was finished after the 5 s interval. After the role-play, the other participants had 10 s to evaluate the role-play by recording the presence or absence of each criterion of a correct question on a sheet (see *Materials*). Then the trainer provided feedback to the participant of the role-play while using the flowchart (see Figure 1). Correct responses were followed by praise and the participant was allowed to move the pawn of the table game forward by three boxes. In cases of an incorrect or no question, the audiotape of the role-play was rewound and the trainer provided corrective feedback. In addition, a least-to-most prompting procedure (Miltenberger, 1997) was started consisting a prompt hierarchy of indirect verbal instruction, direct verbal instruction, and finally modelling the correct response. Following an incorrect or no question during role-play, the participant was not allowed to move the pawn. After providing feedback to the participant in the role-play, the trainer provided feedback to the other participants regarding their evaluation of the question. The pawn was moved forward one box in case they had evaluated the question of the participant in the role-play correctly. However, following an incorrect evaluation the trainer gave corrective feedback to that participant and he/she was not allowed to move the pawn.

At the end of the session the results of the game were evaluated. The participant who attained the highest number on the game board was praised. Next to this, trainer provided feedback to each participant comparing the results of the five role-play exercises to the results of the previous session. If the percentage of correct questions during the role-play was identical to or exceeded the results of the previous session, the participant could earn a reward. This reward was given by the personal coach in the next tutorial conversation, but only when the participant asked for it. Finally, at the end of each session, participants were instructed to use the flowchart during their tutorial conversations.

### *Social validity*

After follow-up data were collected, a questionnaire was completed by coaches and participants concerning the effects of training and the acceptability of the teaching procedure. This consisted of questions regarding (1) acceptance of the instructions regarding tutorial conversations (coaches) or acceptance of the training (participants), (2) success of the

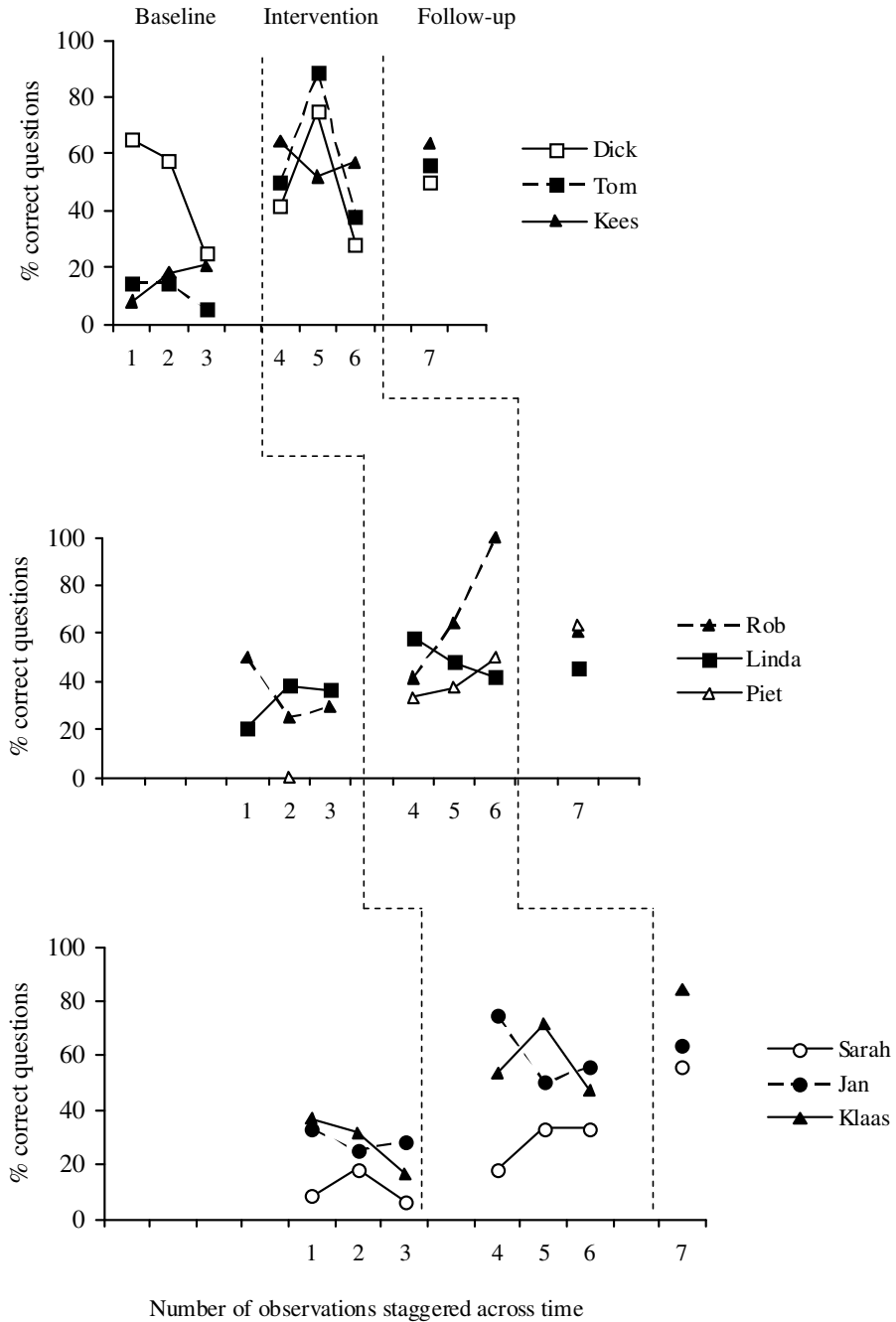
intervention, (3) use of the flowchart during tutorial conversations, and (4) additional prompts needed to ask questions.

## Results

Figure 2 shows percentages of correct responding during the last three observations of the conditions of baseline and training, and during follow-up.

Table 2 depicts mean percentages of correct questions for each participant during all experimental conditions. The mean percentage of correct questions during tutorial conversations increased substantially after training in all participants, except in participants Dick and Rob. During intervention, Dick and Tom exhibit a drop in level of correct questions. However, the percentage of correct questions stays beyond baseline level for Tom, but not for Dick. Also during baseline, Dick shows a drop in his data. A stimulus control problem may underlie these findings. During follow-up, the percentage of correct questions showed a further substantial increase in three participants (Piet, Sarah, and Klaas) and had stabilized in the other participants. Data were analysed using Time Data Analysis (TIDA), a time series program that takes into account serial dependency between scores (Oud & Bendermacher, 1998). TIDA tests for changes in level and trend of the curve between adjacent experimental conditions. A statistically significant increase in level of correct questions was found between the phases of baseline and intervention ( $t(11) = 3.58, p = .004$ ). There was no significant difference for trend in correct questions between baseline and intervention phases.

Mean response efficiency during baseline, training, and follow-up is depicted in Table 3. During baseline, there were already high scores of mean response efficiency in five participants (Dick, Tom, Rob, Linda, and Jan). Training resulted in maintenance or further and substantial increase (Kees, Piet, Sarah, and Klaas) in response efficiency, and effects were maintained during follow-up. The high response efficiency of five out of nine participants during baseline means that during tutorial conversations, they (nearly) always asked questions in a correct way. In these cases, the increase in correct questions during the phases of training and follow-up occurred as a result of an increase in their use of opportunities for question asking. This result suggests an improvement in the performance of skills already mastered.



**Figure 2.** Percentage correct questions during baseline, intervention, and follow-up for each participant in each group, in the non-concurrent multiple baseline design across three groups.

**Table 2.** Mean percentages of correct questions, standard deviations, and ranges during baseline, training, and follow-up.

P	Baseline			Training			Follow-up		
	<i>M</i>	SD	Range	<i>M</i>	SD	Range	<i>M</i>	SD	Range
Dick	54	22	25-65	58	20	29- 75	50	5	43-52
Tom	15	9	5-27	43	26	23- 89	50	11	41-56
Kees	17	7	8-22	57	6	52- 64	53	14	43-67
Rob	55	23	25-65	59	23	42-100	62	17	50-83
Linda	29	10	21-38	52	13	42- 75	48	6	44-55
Piet	0	–	–	40	5	33- 50	62	2	59-63
Sarah	14	8	0-22	26	9	18- 33	45	14	36-56
Jan	29	4	25-33	59	13	50- 75	64	–	–
Klaas	30	8	17-37	57	13	47- 71	84	–	–

NB. P, participant; *M*, mean; SD, standard deviation.

**Table 3.** Mean response efficiency, standard deviation, and range during baseline, training, and follow-up.

P	Baseline			Training			Follow-up		
	<i>M</i>	SD	Range	<i>M</i>	SD	Range	<i>M</i>	SD	Range
Dick	99	2	96-100	100	–	–	100	–	–
Tom	100	–	–	100	–	–	100	–	–
Kees	55	19	33- 71	100	–	–	100	–	–
Rob	91	11	75-100	100	–	–	97	5	75-100
Linda	100	–	–	100	–	–	100	–	–
Piet	–	–	–	92	12	75-100	100	–	–
Sarah	80	22	50-100	100	–	–	100	–	–
Jan	100	–	–	100	–	–	100	–	–
Klaas	66	16	46- 86	93	6	89-100	100	–	–

NB. P, participant; *M*, mean; SD, standard deviation.

*Social validity*

Eight participants reported that they had learned important new skills as a result of the intervention. Two participants still used their flowchart at follow-up. The others found that they did not need any additional instructional prompts anymore as they had incorporated a mental scheme of the flowchart. According to the coaches, eight participants displayed an increase in asking correct questions during their tutorial conversations as a result of training, two participants still used their flowchart, and four participants needed additional indirect verbal prompts to ask questions (e.g., “Go ahead” or “Think about your flowchart”). Both coaches and participants reported the training was effective as well as acceptable.

**Discussion**

A time-limited training package resulted in a statistically and clinically significant improvement in question asking in nine high-functioning adolescents during their tutorial conversations. In general, these effects were maintained during follow-up at 1 month. The skill of asking correct questions generalized from the therapy room with the trainer to the natural setting of the tutorial conversation with the personal coach. This may be attributed to the self-management strategy, the visual cue (flowchart), and the common stimuli (i.e., flowchart, 5 s silence, topics of conversation) included in the training package. The use of multiple stimulus and response exemplars and natural contingencies (answers to questions) may also have contributed to these positive findings (Koegel et al., 1998; Stokes & Osnes, 1989). Because the training package included many elements, it is unclear which specific element is responsible for our results.

Results in five participants suggest a performance deficit rather than a skill deficit. This finding is in accordance with present research that social and communicative impairments found in persons with ASD are some kind of performance deficit rather than an absolute ability deficit (Hale & Tager-Flusberg, 2005b; Warreyn et al., 2007). This performance deficit may be explained by insufficient stimulus control and poor self-management skills. It may be concluded that, as a result of training, stimulus control was enhanced and self-management skills were improved.

The social validity assessment shows that the positive changes in question asking were observed by the participants as well as by their coaches. The coaches reported that the use of the 5 s silence was an effective way of controlling their tendency to react too quickly by asking questions of their own, without giving clients enough opportunities to ask questions.

A group teaching format has benefits during social skills teaching as there are many opportunities for observational learning and mutual feedback. It is more efficient than one-to-one training formats in terms of learning opportunities and costs (Smith Christopher, Nangle, & Hansen, 1993; Weiss & Harris, 2001). Hansen, St. Lawrence and Christoff (1989a) have made some critical remarks on group training formats because of the difficulty to keep participants actively involved and interested. To limit this potential drawback, a table game and mutual feedback were used in the present study.

Some limitations of the present study should be mentioned. First, no data were collected in other natural settings (e.g., group meetings, mealtimes), nor were long-term follow-up data collected. Second, no formal data on procedural integrity were collected. However, the trainer used a flowchart of the procedure to control for variations in its implementation. Also, no data on the use of prompts by coaches, different from the 5 s silence intervals, were collected during tutorial conversations. Finally, during baseline, two participants (Dick and Rob) asked correct questions in more than 50% of the opportunities (see Table 2). During intervention, their mean increase in asking correct questions was relatively limited. In future studies more stringent selection of participants is needed. At this time, there are no normative data on frequency of question asking. In general, there is a lack of criteria in judging the conversational competence of persons with ASD. These data are needed to set treatment goals in developing more normalized conversational discourse, and future research should address this issue (e.g., Rogers, 2000).

Despite these shortcomings, this study suggests that an important conversational skill, such as asking questions, may be taught relatively quickly to high-functioning adolescents with ASD using behavioral analytic procedures in which generalization strategies are included. Persons with ASD learn such skills as a set of rules which can be applied without referring to mental states (e.g., Chin & Bernard-Opitz, 2000). These types of interventions offer effective ways of improving social communicative functioning in natural settings (Griffiths et al., 1997; Koegel et al., 1998; Weiss & Harris, 2001). Finally, question asking is only one component of discourse initiation. Future studies should incorporate a broader range of initiation skills and should investigate the efficacy and effectiveness of time-limited procedures in high-functioning adolescents and adults with ASD.

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## **Chapter 4**

### **Effectiveness of behavioral skills training on staff performance in a job training setting for high-functioning adolescents with autism spectrum disorders**

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**Abstract**

Few studies have focused on improving staff performance in naturalistic training settings for high-functioning adolescents with autism spectrum disorders. Behavioral skills training, consisting of group instruction and supervisory feedback, was used to improve staff performance on (a) providing positive reinforcement, (b) providing error correction, and (c) initiating opportunities for students to show the target response (i.e., ‘asking for help’). Also changes in students’ target response and generalization of staff performance were evaluated. Data were collected in a multiple baseline design across three staff skills. There were improvements in all staff skills and changes in ‘error correction’ as a result of intervention were statistically significant. Improvements in staff skills were maintained over time. Effects of intervention on students’ target responses and generalization of staff performance, however, were limited. Staff evaluated the intervention as effective and acceptable. Implications of the findings and suggestions for future research are discussed.

**Effectiveness of behavioral skills training on staff performance in a job training setting for high-functioning adolescents with autism spectrum disorders**

Applied behavior analysis (ABA) is considered best practices for teaching adaptive skills to individuals with autism spectrum disorders (ASD) (Callahan, Henson, & Cowan, 2008; Sheridan & Raffield, 2008; Simpson, 2005). ABA consists of a range of procedures such as task-analysis, modelling, prompting, fading, shaping, reinforcement, self-monitoring, role-play, and feedback, and has shown to be effective in teaching adaptive skills to children with ASD (see Arick, Krug, Fullerton, Loos, & Falco, 2005). ABA procedures have also been effective in teaching adaptive skills to high-functioning adolescents with ASD, although the number of studies in this target group is still small. In one of these studies, Palmen, Didden and Arts (2008) demonstrated that a group training consisting of prompt fading, feedback, and self-management was effective in improving question asking during tutorial conversations in nine high-functioning adolescents with ASD.

An important issue in implementing ABA procedures in educational and care settings for persons with ASD is staff training. Shortcomings in staff performance may have negative consequences for the student's progress and may even strengthen inadequate student behaviors (Dib & Sturmey, 2007; Koegel, Russo, & Rincover, 1977). Studies have been published on improving accuracy of staff performance when teaching students with ASD. They have evaluated highly structured strategies with children on a one-to-one basis, such as discrete trial teaching (e.g., Dib & Sturmey, 2007; Koegel et al., 1977; Leblanc, Ricciardi, & Luiselli, 2005; Sarakoff & Sturmey, 2004, 2007) and assessing stimulus preferences (Lavie & Sturmey, 2002). These studies show that behavioral skills training packages (BST), consisting of instruction, modelling, rehearsal and feedback, are effective in improving staff performance.

Several studies have focused on implementing more naturalistic teaching procedures. For example, Schepis, Reid, Ownbey, and Parsons (2001) used BST with four support staff members to embed their teaching within the existing activities of five children with intellectual disabilities, of whom two also had autism, in an inclusive preschool. BST was aimed at improving staff members' accuracy in identifying and creating teaching opportunities and in applying least-to-most prompting, error correction, and reinforcement in teaching two students. Improvements in staff members' teaching strategies were accompanied by improvements in children's adaptive functioning. BST was also used by Wood, Luiselli and Harchik (2007) in

four direct care staff members who were trained to conduct non-verbal communication instruction with a non-verbal 24-year-old man with ASD and intellectual disability. Staff training was conducted under natural conditions at the man's group home and was effective in improving accuracy of instruction for all staff members. Generalization across staff behaviors, however, was not assessed.

Staff training for improving adaptive skills in high-functioning adolescents with ASD is an under-researched topic. The present study evaluated the effectiveness of BST on staff performance in a job training setting for high-functioning adolescents with ASD. Its purpose was to improve staff's performance on: (a) providing positive reinforcement following a correct target response (i.e., 'asking for help') by a student, (b) providing error correction following an incorrect target response, and (c) initiating opportunities for a student to show the target response. Changes in students' target response were also evaluated. We also assessed if BST resulted in generalization of staff performance to an untrained students' target response (i.e., 'working on a task'). Finally, data were collected on the acceptability of BST.

## **Method**

### *Setting and Participants*

The study was conducted in the training centre of a treatment facility for persons with ASD. The centre provides educational services such as social-, leisure-, and job-skills training to students with ASD. Students were adolescents with ASD who had a (WISC or WAIS) verbal IQ of at least 70. All students had a diagnosis of ASD as established by a licensed psychiatrist according to DSM-IV criteria.

Participants were four staff members of whom two were females. Their mean age was 46 years (range 41–50 years) and their mean work experience at the job training setting was 7.9 years (range 3–15 years). Each staff member trained a group of students (3 or 4) at least two times a week. Staff members and students participated on a voluntary basis and informed consent was obtained from each of them.

Staff members provided job training in a simulated work setting. A training session lasted 50 min. The purpose of the training was to improve students' job-related skills such as technical job-skills, on-task behavior, keeping appointments, and communicative skills such as asking for help and greeting. Students performed job-related tasks during gardening, office cleaning, and industrial work. During these tasks, teaching opportunities for students' target responses could be initiated by the student by displaying correct or incorrect target responses as well as by staff members by evoking target responses from students.

Staff training consisted of one group session and six individualized supervisory feedback sessions per staff skill (see *Procedure*). The group session was provided in a therapy room and supervisory feedback was given in the job training room where the staff member conducted his/her job training.

Two psychologists working at the training centre participated as supervisors. Two undergraduate university students majoring in psychology participated as observers. Data on staff performance were collected during staff's regular job training sessions.

### *Materials*

During the group session, written instructions were used for explaining (a) content of the training, (b) components and implementation of the staff skill, and (c) task analysis of the students' target response 'asking for help'. Also, videotaped simulated staff-student interactions were shown. A checklist was used to evaluate staff performance in videotaped staff-student interactions and in role-play exercises. The checklist provided behavioral definitions of the staff skill and space for evaluating staff performance as 'correct', 'incorrect/omitted', or 'no opportunity'.

During supervisory feedback, supervisors used a flowchart depicting guidelines for feedback (see Figure 1) and a checklist containing their registrations of staff member's performance during the regular job training session.

### *Recording*

For each staff member, data were collected during 30 min observation periods which were scheduled between the 5th and 50th min of a job training session. Starting points of the observation periods were chosen at random. At the beginning of each observation period the observer recorded how many students participated in the job training. Then, a continuous 20 s interval recording system was used to collect data on presence (+) or absence (-) of each of the following three categories: (a) correct question for help by a student (= opportunity for positive reinforcement), (b) incorrect question for help by a student (= opportunity for error correction), and c) staff members' initiation of a question for help by a student (= opportunity for question for help).

If an opportunity was scored as present, it was subsequently recorded whether the staff member used that opportunity in a correct way, that is, whether he/she implemented



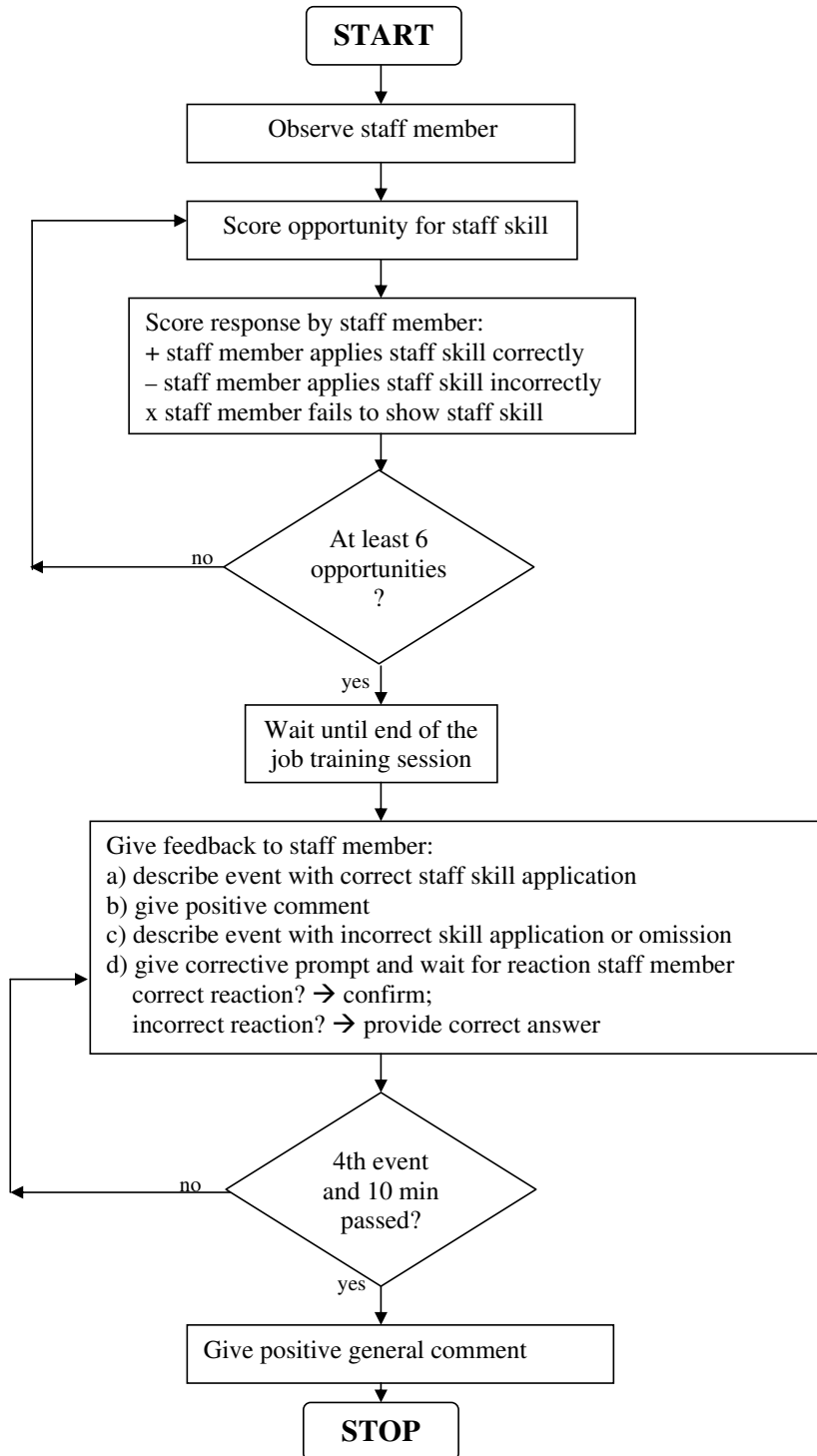


Figure 1. Flowchart of the supervisory feedback procedure.

reinforcement, error correction or response initiation correctly. If an opportunity was recorded during an interval but the scoring of staff member's use of the opportunity was not completed within that interval, scoring of the staff performance was completed in the next interval. Staff performance was recorded as correct if all the criteria of the staff skill were scored as present (+). Staff performance was recorded as incorrect if at least one of the criteria was scored as absent (-). The observation categories were defined as follows:

*Correct question for help by a student (opportunity positive reinforcement).* This category was endorsed if a student asked for help in a correct way, that is: (a) student is at a distance of maximum 1.5 m from staff member, (b) student speaks in his or her customary voice (e.g., does not shout), (c) student makes contact with staff member (e.g., student calls name of staff member or touches him/her on shoulder), (d) staff member is not interacting with another person or is not otherwise occupied; if the staff member is occupied or interacting, student asks for permission to ask a question, (e) student's question is related to his/her job task (e.g., "..., where can I find the screwdriver?") and (h) question begins with an interrogative, such as 'who', 'which' or 'where'.

*Correct reinforcement following an opportunity for positive reinforcement.* This category was endorsed if (a) staff member makes contact with student (e.g., calls name of student or looks at the student), (b) staff member provides a positive consequence (praise or other positive comment) following a correct question (e.g., "..., good question for help.", or "..., that was perfect, you asked me for help after I finished my conversation with..."), (c) consequence is given within 10 s after the correct question or, if the student has asked the question some time ago, staff member relates this comment to the correct question asked earlier (e.g., "..., 20 min ago you asked for a screwdriver by saying 'Trainer, please could you help me by giving me a screwdriver', I gave you this screwdriver, but I also want to let you know that you formulated your question in a perfect way; go on like this."), and (d) staff member answers question or gives the referent the student asked for.

*Incorrect question for help by a student (opportunity error correction).* This category was endorsed if the question for help by the student did not attain all criteria of a correct question (see *Correct question for help by a student*).

*Correct error correction following an opportunity for error correction.* This category was endorsed if (a) staff member makes contact with student, (b) staff member uses a prompt fading procedure to elicit a correct question for help; for example, if a student made an error by yelling the question ("Trainer, where do I find the scrubber?"), staff member could use a silence cue or gesture prompt (e.g., waiting 5 to 10 seconds to enable the student to correct the

question himself, or drop a hint by making a whisper sign); if this prompt was not effective, more assistance should be given, for example by using a verbal hint (e.g., "..., there is something with your voice."), (c) prompt fading procedure was conducted within 10 s after the incorrect question, or staff member verbally relates the prompt fading procedure to the incorrect question asked earlier ("..., 1 min ago you asked for a screwdriver by yelling your question, you can ask your question in a better way, how could you do that...?"), and (d) the prompt fading procedure results in a correct question.

*Staff members' initiation of a question for help (opportunity for a student to ask a question for help).* This category was endorsed if a staff member prompts a student to initiate a question for help, by using a verbal hint (e.g., "..., if you don't know what kind of colour to use, what could you do to solve this problem?"), or instructing student to ask a question (e.g., "..., if you don't know what kind of colour to use, you could ask me a question, let's try ...."), or using additional prompts (e.g., "...if you don't know what kind of colour to use, you could ask me a question, let's try, 'trainer, could' ...").

*Correct initiation of a question for help.* This category was endorsed if staff member's initiation results in a correct or an incorrect question for help by the student.

### *Dependent measures*

#### *Staff Performance*

For each staff member, mean percentage *Correct reinforcements* was calculated by dividing the number of intervals with correct reinforcement by the number of intervals with an opportunity for reinforcement, multiplied by 100. This score reflects the proportion of the number of correctly applied reinforcements by staff members and number of opportunities for staff members to apply reinforcement.

Mean percentage *Correct error corrections* was calculated by dividing the number of intervals with correct error correction by the number of intervals with an opportunity for error correction, multiplied by 100. This score reflects the proportion of number of correctly applied error corrections by staff members and the number of opportunities for staff members to apply an error correction.

Mean percentage *Correct initiations* was calculated by dividing the number of intervals with correct initiation by the number of intervals with an opportunity for a question for help by a student, multiplied by 100. This score reflects the proportion of number of correctly applied initiations by staff members and number of opportunities for students to ask a question for help.

*Student performance*

The following measures were related to student performance: number of (a) correct, (b) incorrect, and (c) correct and incorrect questions for help asked per student and (d) response efficiency. The number of questions for help asked by each student were calculated by dividing the number of intervals with respectively correct, incorrect, and correct and incorrect questions by the number of students participating in the job training session.

Response efficiency was calculated by dividing the number of intervals with a correct question for help by the number of intervals with a correct or an incorrect question for help, multiplied by 100. This score reflects the proportion of number of correct questions and the total number of questions asked by students.

*Generalization of staff performance*

To assess whether generalization across student behaviors occurred, data were collected on staff's application of *reinforcement*, *error correction* and *initiation* with respect to a second target response of students: 'working on a task'. During intervention, staff members did not receive feedback during their job training sessions on how to reinforce, correct or initiate 'working on a task' by students. Generalization data were collected in the same way as the data regarding the target response 'asking for help'. The observation categories were defined as follows:

*'On-task behavior' (opportunity positive reinforcement)*. This category was endorsed if a student who is working on a task shows one of the following behaviors: (a) student is engaged in the task as instructed by staff member, or (b) student is visually attending to the task activity or to the task instruction scripts, or (c) student is manipulating task materials appropriately.

*Correct reinforcement 'on-task behavior'*. Staff member gives reinforcement for students' on-task behavior in a correct way. This category was endorsed if (a) staff member makes contact with the student, (b) staff member provides positive consequences, praise or other positive comments following on-task behavior, and (c) staff member provides positive consequences contingent on 'on-task behavior' or, in stating a positive comment on on-task behavior shown earlier, staff member verbally relates this comment to the on-task behavior shown earlier.

*'Off-task behavior' (opportunity response correction)*. This category was endorsed if a student who is working on a task shows behavior that does not attain one of the criteria of 'on-task behavior' (see '*on-task behavior*').

*Correct error correction 'off-task behavior'*. Staff member applies error correction in a correct way. This category was endorsed if (a) staff member makes contact with the student, (b) staff member uses a prompt fading procedure to elicit 'on-task behavior' from the student, (c) staff member uses prompt fading contingent on 'off-task behavior', and (d) prompt fading results in 'on-task behavior'.

*Staff members' initiation of 'working on a task' (opportunity for a student to start a task)*. This category was endorsed if a student has to start a new task and staff member prompts student to start a new task by using a verbal hint (e.g., '...., tell me which task do you want to do today?...Ok, lets start'), or instructing the student to start a new task ('....., please paint the roof of this nest box in a green colour'), or using additional prompts ('...please paint the roof with this colour, look ... -modelling the task-, go ahead').

*Correct initiation of working on a task*. This category was endorsed if staff member's initiation results in the student starting to work on a task.

Generalization data regarding staff performance were calculated in the same way as the dependent measures (see above).

#### *Reliability of recording*

During pre-baseline, a secondary observer received instruction on the observation categories and the recording system. During regular job training sessions, the secondary observer simultaneously but independently recorded at a distance of 1.5 m from the primary observer. Both observers used headphones which were connected to a mp3 player worn by the primary observer.

Interobserver agreement on *occurrence* (Mudford, Hogg, & Roberts, 1997) was assessed on an interval-by-interval basis and calculated by dividing the number of agreements by the number of agreements and disagreements, multiplied by 100. Collection of baseline data started after an interobserver agreement on occurrence of at least 80% was attained for each category.

During 15% of the sessions, reliability checks were conducted which were approximately equally distributed across participants and conditions. Mean reliability for all (i.e., 12) observation categories was 91% (range 67-100%). Mean percentages of agreement on occurrence for the categories '*staff members' initiation of a question for help*', '*correct initiation of a question for help*' and '*staff members' initiation of working on a task*' were somewhat lower, that is 75, 67, and 73, respectively. Mean percentages of agreement on occurrence for the other categories, however, were all above 90.

### *Design*

Data were collected in a multiple baseline design across three staff skills (Kazdin, 2003). Pre-baseline lasted 8 weeks. Baseline conditions were in effect between 7 and 16 weeks. Intervention lasted 3–4 weeks, and post-intervention lasted 7 and 3 weeks for the first two staff skills. Follow-up data were collected 2 weeks after the intervention for the last staff skill (i.e., initiation).

### *Procedure*

*Pre-Baseline.* For each staff member, observers recorded data during at least 8 observation sessions to reduce reactivity for the presence of observers. No staff instruction or feedback was given nor did a supervisor approach staff member after a training session.

*Baseline.* During this phase no staff instruction or supervisory feedback was in effect. The number of recording sessions was 8, 14, and 20 for ‘reinforcement’, ‘error correction’ and ‘initiation’, respectively. Three weeks preceding the start of the intervention of a staff skill, the first author trained supervisors on procedures for recording and supervisory feedback. Supervisor training consisted of three 45 min sessions and included verbal and written instruction on the definition of the targeted staff skill and on the feedback script, recording and evaluation of videotaped simulated staff-student interactions, modelling, role-play, and feedback. Two weeks preceding start of the intervention of the first staff skill, a supervisor was present during job training sessions. Immediately after a training session, the supervisor approached the staff member and held a conversation (its content was unrelated to staff performance) to control for increased supervisor attention during intervention.

*Intervention.* Intervention consisted of one 2-hr group training session followed by six individual supervisory 10-min feedback sessions per staff skill. Data were collected after each feedback session and data were recorded during six observation sessions for each staff member.

*Group training.* The session consisted of (a) introduction, (b) instruction, (c) video evaluation, and (d) role-play, modelling and feedback.

(a) *Introduction.* Aim and content of the intervention was explained to staff members and students’ primary (i.e., ‘asking for help’) target response was defined.

(b) *Instruction.* Task analysis of the students’ primary target response ‘asking for help’ was reviewed and staff members discussed examples of the criteria of a correct target response. Then, the rationale of the staff skill was reviewed and staff members’ experiences

with the skill were discussed. Each staff member received a script with the criteria of the staff skill (see *Observation categories* of the staff skills).

(c) *Video evaluation*. Staff members were shown videotaped simulated staff-student interactions during job training. (Staff members and students who were depicted on the videotapes did not participate in the study.) Each interaction contained two elements: (a) student asks for help (in a correct or an incorrect way) or fails to ask for help, and (b) staff member responds. For example, in case of ‘error correction’: student: ‘..., the hammer?’ (opportunity for error correction ‘question for help’); staff member responds within 10 sec: ‘..., there is a hammer on the table’ (staff member fails to provide error correction).

Trainer introduced a checklist to evaluate videotaped fragments and modelled the scoring and evaluation procedures thereby using several examples. Trainer prompted staff members by using a least-to-most procedure to evaluate each component of the targeted staff skill. After this, all staff members simultaneously but independently scored eight videotaped fragments. Following each fragment, trainer provided feedback on staff members’ evaluations. In case of an incorrect evaluation the trainer provided corrective feedback using written response criteria (see *Observation categories*).

(d) During *role-play, modelling and feedback*, each staff member took part in role-play exercises in which two staff members each played a different role (i.e., staff versus student). To promote generalization, four target responses (i.e., asking for help, on-task behavior, greeting, and consulting) by students were equally distributed across exercises. Roles of the student and staff member were (partially) described. Each role-play contained two elements: (a) student shows a correct or an incorrect target response, or shows no target response (= opportunity staff skill), and (b) staff member has to respond. For example, in case of the staff skill ‘reinforcement’: target response: ‘Consulting’; role student: ‘You are painting a nest box in a green colour; you think that it would be nice to paint the roof of the nest box in another green colour; you walk to your job trainer and you propose your idea to him/her’ ‘..., I would like to..., what do you think of this idea?’ (correct consulting); role staff member: ‘Student X approaches you and tells you something’. What do you do? ...’. Following the role-play, the other staff members evaluated the role-play by scoring the presence or absence of each component of the targeted staff skill using the checklist (see *Materials*). Then the trainer provided feedback. In case of an incorrect staff response, trainer modelled the correct staff skill and the role-play was repeated by the same two staff members.

*Supervisory feedback*. Six supervisory feedback sessions were conducted per staff member. Each feedback session lasted 10 min and was conducted immediately following the

job training session in which supervisor collected data using the checklist of the targeted staff skill. During the job training session, supervisors recorded at least six correct and incorrect applications of the staff skill that was targeted for intervention (see Figure 1). Supervisor provided feedback using written response criteria of the targeted staff skill. The supervisory feedback (Arco, 2008) followed a 4-step script (see Figure 1) consisting of (a) describing an event with a correct application of the staff skill, (b) praising the staff member for this correct staff skill, (c) describing an event with an incorrect application or omission of the staff skill, and (d) prompting staff member to avoid a future error or omission (e.g., reinforcement: "...can you tell me what you should do next time in case of a correct question ..."). If staff member failed to give an answer or gave an incorrect answer, supervisor provided the correct answer with help of the written criteria of the targeted staff skill. The feedback script was rehearsed for at least four observed events of the targeted staff skill. Finally, supervisor ended the feedback session with a positive comment about the job training session. At the end of the sixth feedback session, staff member was encouraged to continue applying the staff skill using the written instruction.

*Post-intervention.* Post-intervention was in effect for the first staff skill (i.e., reinforcement) and the second staff skill (i.e., error correction). Supervisory feedback was no longer given for that staff skill, but supervisory feedback was started for the new staff skill in intervention. Data were collected during 12 observation sessions for the first staff skill and during 6 observation sessions for the second staff skill.

*Follow-Up.* During follow-up, staff members did not receive instruction and supervisory feedback sessions had been withdrawn for all staff skills. Data were recorded during four observation sessions for each staff member

### *Acceptability*

One week after the intervention for the last staff skill, data were collected to assess staff members' evaluation of the training procedure. A questionnaire was used that consisted of 15 questions regarding (a) acceptability of the content of the intervention, (b) efficacy of each of the intervention aspects, and (c) effectiveness of the intervention. Each question was rated on a 5-point Likert-type scale ranging from '1' (not at all) to '5' (very much).



## Results

### *Staff performance*

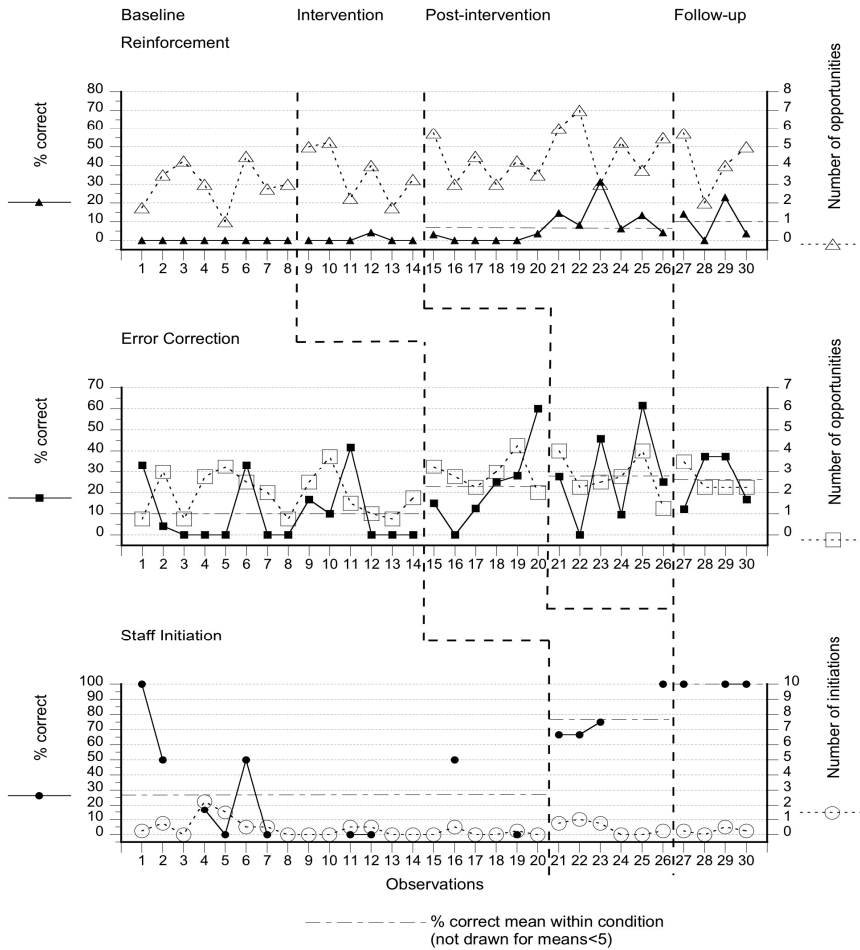
Figure 2 shows the mean number of opportunities and mean percentage of staff's correct opportunities for 'reinforcement', 'error correction' and 'initiations' of questions for help across conditions. (No percentages were plotted for observation sessions in which no opportunities were observed.)

Mean percentages of *correct reinforcement* and mean numbers of opportunities for reinforcement during baseline and intervention were 0% and 0.7%, and 3 and 4, respectively. During post-intervention, mean number of opportunities was 5 and mean correct reinforcement was between 0 and 31% of the opportunities (mean = 7%). Data show an increase in correct reinforcement following session number 20. This may be the result of a generalization effect as intervention for the third staff skill (i.e., initiation) started after the 20<sup>th</sup> session. During follow-up, staff applied correct reinforcement on 0 - 23% of the opportunities. The increase in mean percentages was maintained (mean = 10%), although the number of opportunities decreased to intervention level (mean = 4).

For the staff skill *error correction*, there was an increase in mean percentage correct opportunities from 10% during baseline to 23% during the intervention condition. Mean number of opportunities per session was 2 during baseline and 3 during intervention. During post-intervention and follow-up, mean numbers of opportunities were the same as during intervention and percentages of correct opportunities showed a further slight increase, that is 28% and 26%, respectively.

No *initiations* from staff were observed during 10 of the 20 baseline sessions. If staff initiated opportunities for students to ask a question for help, they emitted correct initiations between 0 and 100% of the opportunities, with a mean of 27%. During intervention, mean percentages increased to 77%. If there was an opportunity for correct initiation during follow-up, it was applied correctly (mean = 100%). The mean number of opportunities initiated by staff was low during all conditions, that is less than 1.

To strengthen trends revealed above, data for correct opportunities for reinforcement and error correction were analysed using Time Data Analysis (TIDA), a time series program that takes into account serial dependency between scores (Oud & Bendermacher, 1998). TIDA tests for changes in level and trend of the curve between adjacent experimental

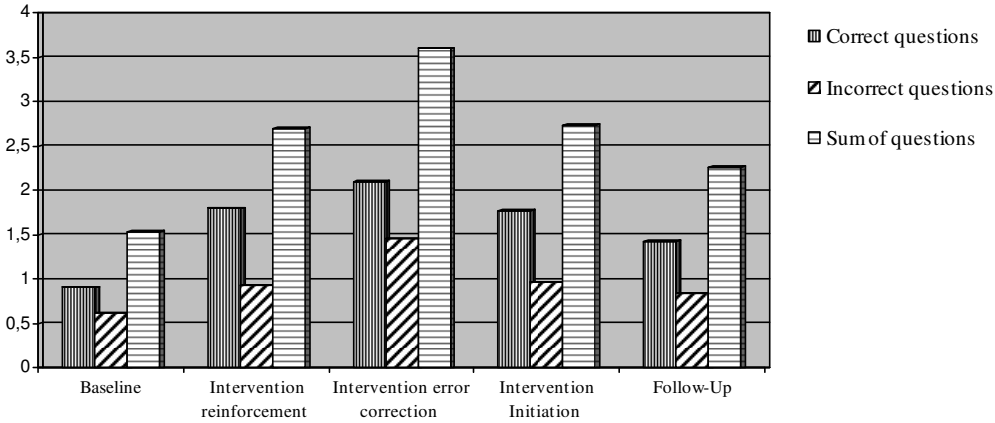


**Figure 2.** Mean numbers of opportunities and mean percentages of correct opportunities for each staff skill, during each experimental condition.

conditions. The difference in correct reinforcement between intervention and post-intervention failed to reach significance ( $F(1,1) = 3.87, p = .14$ ). The increase in correct error correction was significant between baseline and intervention,  $F(1,1) = 49.9, p = .01$ , and between intervention and post-intervention,  $F(1,1) = 10.26, p = .049$ .

*Student performance*

Data on students' questions for help are presented in Figure 3.



**Figure 3.** Mean number of correct questions, incorrect questions, and sum of questions per student, per session, during each experimental condition.

Mean number of questions per student increased from baseline (mean = 1.5) to 2.7, 3.6, and 2.7 during intervention for reinforcement, error correction and initiation, respectively. Number of correct questions per student increased from 0.9 during baseline to 1.8, 2.1, and 1.8 during intervention for reinforcement, error correction and initiation, respectively. Response efficiency was highest (i.e., 66% and 65%) during intervention for the staff skills *reinforcement* and *initiation*, respectively. During the intervention for *error correction*, response efficiency decreased to baseline level (mean = 59%) as a result of a relatively higher percentage of incorrect questions. During follow-up, there was a slight decrease in mean number of questions asked per student (mean = 2.3), though means and response efficiency (mean = 63%) were still all above baseline level.

*Generalization of staff performance*

Data on staff's generalization skills of reinforcement, error correction, and initiations for students' *working on a task*, suggest that generalization occurred for *reinforcement*. During baseline, staff applied correct reinforcement for *on-task behavior* during 0-6% of the opportunities (mean = 3%). Means increased to 10% and 16% during intervention and post-intervention, respectively. During follow-up, percentages decreased to baseline level (mean = 4%). Results from TIDA, however, showed that the difference in means between baseline and intervention, and between intervention and post-intervention failed to reach statistical significance,  $F(1,1) = 1.72, p = .28$ , and  $F(1,1) = .61, p = .49$ , respectively. No increases were found for staff's application of correct error correction for students' off-task behavior, nor for staff's correct initiations for students' to work on a task.

*Acceptability ratings*

Staff rated the training package highly acceptable (mean = 4.3) and very important (mean = 4.5). Feedback was rated as most effective part of the training package (mean = 4.5). Group training was rated 4.1. Regarding the components of group training, instruction and role-play were rated as the most efficacious, with means of 4.2 and 4, respectively. Mean rating of video evaluation was lower, i.e. 3.5. Staff's mean ratings concerning effectiveness of the intervention for the three skills were 3.75 for reinforcement, 3.5 for error correction and 4 for initiations, respectively.

**Discussion**

The present study evaluated effectiveness of BST on staff performance during naturalistic job training for high-functioning adolescents with ASD. BST resulted in an improvement of staff performance during job training sessions, and these effects were maintained during follow-up. Data also showed an increase in response efficiency and correct target behavior (i.e., asking for help) by students. Staff did not generalize skills to an untrained students' second target behavior (i.e., working on a task).

Data showed an increase (though not statistically significant) in mean *correct positive reinforcement* only after the 20<sup>th</sup> session and halfway during post-intervention. A generalization effect may underlie this trend as at the same time (a) the level of correct responding increased at the end of the intervention condition for error correction and (b) intervention for the third staff skill (i.e., initiations) started.

In general, overall level of correct positive reinforcement is relatively low and the effect of BST on correctly applied reinforcement may seem disappointing. There were much more opportunities for reinforcement than correctly applied reinforcements. Staff commented that providing positive reinforcement following a student's correct question is 'artificial'; they believed that providing an answer to the student may already function as a natural reinforcer. Staff's beliefs about reinforcing student behavior may function as setting condition (Allen, 1999). Concerning providing answers to students' questions, observers and supervisors noted that staff members relatively often gave an answer following an incorrect question instead of providing error correction, which may have resulted in inadvertent reinforcement of incorrect questions. Staff was instructed to refrain from giving an answer to an incorrect question as part of the corrective feedback concerning error correction. Staff's opinions and beliefs concerning staff skills to be trained (e.g., providing positive reinforcement) should be addressed in future studies. Future studies also should address type and frequency of corrective feedback on providing positive reinforcement by staff during BST.

Generalization of staff's skills may have occurred as correct reinforcement for the students' second target skill (i.e., working on a task) increases (though not statistically significant) as a result of intervention. Surprisingly, percentages of correct reinforcement for students' on-task-behavior were higher than those for students' correct questions. Staff may believe that reinforcing on-task behavior is of more importance than reinforcing correct questions from students. Little is known about the influence of students' target behaviors on the probability in which they elicit responses from staff. This topic merits further exploration in future studies.

Successful teaching of adaptive skills not only requires a sufficient number of teaching opportunities, but also opportunities that are used correctly by staff. In naturalistic teaching situations, the number of teaching opportunities per session is relatively limited. In such a case, the correct use of opportunities becomes important. Although BST resulted in improved performance by staff, the overall level of correct responding by staff remained relatively low. Staff members were not required to meet any performance criterion before they discontinued the training. In most studies on implementing structured strategies on a one-to-one basis, staff training continues until staff has demonstrated competence, for example by showing 80% or 90% accuracy during two or more consecutive occasions (see e.g., Arco & du Toit, 2006; Dib & Sturmey, 2007; Sarakoff & Sturmey, 2004). Although normative data on staff performance during naturalistic training situations are lacking, it is important to investigate effects of

increasing the number of feedback sessions per week as well as the total number of feedback sessions needed to bring about desired and clinically significant changes.

Staff performance in behavioral treatments entails complex interactions such as prompting and providing consequences that continually change in response to client behaviors (Arco, 2008). Despite limitations of our study, findings of the time-limited BST package are promising and suggest that future research is warranted in improving staff performance in naturalistic teaching settings for high-functioning adolescents with ASD. Future research should focus on evaluating BST containing a larger number of sessions of supervisory feedback per week and across a variety of staff skills and types of students' target responses and whereby long term data are collected. Specific attention should be given to staffs' performance directed towards increasing the number of opportunities in which students' target responses can be elicited.

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## Chapter 5

### **An outpatient group training program for improving leisure lifestyle in high-functioning young adults with ASD: A pilot study <sup>1</sup>**

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**Abstract**

This study examined the effectiveness of an outpatient program on the leisure lifestyle of high-functioning young adults living at home or at an independent setting. A pre-test-post-test control group design was used. Participants ( $N = 12$ ) completed self-reports on (a) need for leisure support, (b) leisure engagement, and (c) satisfaction with leisure lifestyle. The program consisted of cognitive-behavioral techniques. Significant within-group changes for the experimental group ( $n = 7$ ) were found, indicating decreases in ‘need for leisure support’, more regular leisure engagement patterns, and an increase in ‘leisure satisfaction’ following the program. Between-group statistics reveal medium and large effect sizes for decreases in need for leisure support and a medium effect size for increase in ‘leisure satisfaction’, all in favour of the experimental group. Results regarding ‘leisure engagement’ were less clear. The preliminary program was effective in improving leisure lifestyle and suggestions for future research are discussed.

**An outpatient group training program for improving leisure lifestyle in high-functioning young adults with ASD: A pilot study**

The importance of a satisfactory leisure lifestyle for persons with Autism Spectrum Disorder (ASD) cannot be under-estimated as it is related to quality of life. For example, in a sample of 108 adults with ASD, Billstedt, Gillberg and Gillberg (2011) found that among a range of variables such as IQ and occupational situation, only having regular recreational activities contributed to the prediction of a good quality of life. Consistent with this finding, Garcia-Villamizar and Dattilo (2010, 2011) found that among adults with ASD living in a residential facility, participation in leisure activities had a positive effect on their ( $N = 37$ ) quality of life and reported stress levels, as well as on their ( $N = 20$ ) social and communication skills.

To date, several studies have been published on the leisure lifestyle of adolescents and adults with ASD living at home. Results show that the leisure lifestyle of persons with ASD can be characterized by difficulties with peer-related activities, a preference for home-based and solitary leisure activities, and limited participation in social and recreational (formally organized) activities (Brewster & Coleyshaw, 2011; Orsmond, Wyngaarden Krauss, & Mailick Seltzer, 2004; Solish, Perry, & Minnes, 2010).

The quality of leisure lifestyle of persons with ASD may depend on environmental factors such as the number of services received, maternal participation in recreational activities or inclusion in integrated settings, and on person-related factors such as age, impairment in social interaction skills, functional independence or cognitive disabilities (e.g., Brewster & Coleyshaw, 2011; Orsmond et al., 2004). As an example of the latter, a study by Hochhauser and Engel-Yeger (2010) in 25 children with high-functioning autism showed a positive relationship between sensory processing abilities and diversity and intensity of participation in leisure activities. Orsmond et al. (2004) found that having more peer relationships was predicted by younger age and less impairment in social interaction skills. Next to this, they found that a greater participation in social and recreational activities was predicted by greater independence in daily living activities, a greater number of services received and inclusion in school. Brewster and Coleyshaw (2011) found that older children (secondary school) were more likely to engage in the same, solitary, in-home activities than younger ones (primary school) and younger children expressed more willingness to try new activities than older children. They also found that the children lacked knowledge of possible leisure pursuits and how to access these pursuits, which could explain their limited leisure interests.

Given the benefits of leisure engagement and the difficulties in leisure reported by persons with ASD, improving leisure skills is an important part in the treatment and care of persons with ASD. In children with ASD, several studies have been conducted on teaching them age-appropriate leisure skills such as participating in gross-motor activities (Hawkins, 1982), playing with toys (Stahmer & Schreibman, 1992), taking a picture using a digital camera (Kurt & Tekin-Iftar, 2008), or playing a videogame (Blum-Dimaya, Reeve, Reeve, & Hoch, 2010). Studies in adolescents and adults with ASD have focused on persons with ASD and intellectual disability and were aimed at improving leisure engagement by providing leisure opportunities using a structured, leisure activity program (e.g., Garcia-Villamizar & Dattilo, 2010, 2011) or at teaching them leisure activities such as accessing age-appropriate websites (Jerome, Frantino, & Sturmey, 2007) or taking and printing digital photographs (Edrisinha, O'Reilly, Young Choi, Sigafos, & Lancioni, 2011).

As far as authors know, no studies have been conducted on improving the leisure lifestyle of high-functioning youth or adults living at home with their parents or at a (supported) independent setting. As these individuals are often referred to an outpatient clinic for support or interventions, the present study evaluated the outcome of a client-supported, outpatient leisure group program on leisure lifestyle of high-functioning young adults with ASD. The purpose of the program was to (a) reduce participants' need for leisure support, (b) change their leisure activity patterns, and (c) improve their leisure satisfaction. Data were collected through both self-reports and reports from relatives, as the use of multiple informants is stressed in case behavioral measures are lacking (Kalyva, 2010). Therefore, a secondary aim of the present study was to assess the level of agreement in perceptions of (changes in) leisure lifestyle between participants and their relatives.

## **Method**

### *Participants*

Participants were 12 high-functioning young adults with ASD who were recruited in the local area through websites and newsletters for (relatives of) persons with ASD. At the start of the program participants were between 16–31 years of age ( $M = 20.75$ ,  $SD = 4.45$ ) and two of them were female. Inclusion criteria were: (a) between 16–35 years of age, (b) diagnosis of ASD as established by a licensed psychiatrist according to DSM-IV criteria, (c) Full Scale (WAIS or WISC) IQ of at least 85, (d) experiencing difficulties with leisure and being motivated to change their leisure lifestyle, and (e) having experience in group engagements.

*Design*

A quasi-experimental, pre-test-post-test control group design was used to evaluate the effectiveness of the leisure program. Seven participants were assigned to the leisure program group, while five were assigned to the no-intervention control group. Group assignment was based on the order in which participants applied for participation. As a result, group assignment was not random and groups were not matched on age or gender at pre-test. See Table 1 for descriptive characteristics of the two groups.

**Table 1.** Characteristics of participants in the experimental and control group.

	Experimental ( <i>n</i> = 7)	Control ( <i>n</i> = 5)
<i>Age</i>		
Mean age (years)	22.7	18.4
Range	17-31	16-20
<i>Gender</i>		
Female	2	0
Male	5	5
<i>Day Activity</i> <sup>a</sup>		
School/university	2	3
Competitive job	2	1
Supported employment	2	0
Voluntary work	2	2
No work/no school	1	1
<i>Living Arrangement</i>		
With parents	4	4
Supported independent living	2	1
Student housing	1	0
<i>Therapy</i>		
Outpatient	2	2

<sup>a</sup>Not mutually exclusive categories.

*Data collection*

Data were collected on participants' (a) need for leisure support, (b) engagement in leisure activities, and (c) leisure satisfaction. Data were collected through self-reports completed 2–4

weeks before the start of the leisure program and 1–2 weeks after the last leisure program session. The average time interval between pre- and post-testing was 6 months. During this period, participants of the control group did not receive extra attention regarding their leisure skills. Next to this, at pre-test and at post-test a parent or personal coach of seven participants was asked to report participants' 'need for support' and 'engagement in leisure activities' by completing a proxy questionnaire.

For the purposes of our study, three self-report questionnaires were developed to measure *Need for Leisure Support*, *Engagement in Leisure Activities*, and *Satisfaction in Leisure Lifestyle*, respectively.

In developing the questionnaires for 'Need for Leisure Support' and 'Engagement in Leisure Activities', we initially established 24 items based on literature regarding leisure assessment (e.g., Dattilo & Hoge, 1997; Trottier, Brown, Hobson, & Miller, 2002) and on literature regarding various types of leisure activities (e.g., alone, social, in-home, outdoors, gross-motor activities) and leisure management skills (e.g., making leisure choices, planning, arranging activities) in persons with developmental disabilities (e.g., Buttimer & Tierney, 2005; Garcia-Villamizar & Dattilo, 2010; Hawkins, 1982; Orsmond et al., 2004; Van Naarden Braun, Yeargin-Allsop, & Lollar, 2006; Wilson, Reid, & Green, 2006). Ten professional workers (i.e., psychologists, therapists, and direct care staff working in a treatment facility for persons with high-functioning ASD) were asked to assign each item to one of the following three categories: (a) 'Need for leisure support', (b) 'Engagement in leisure activities', and (c) 'Other'. Eight items were rated by at least 75% of the professionals as belonging to the category 'Need for leisure support' and as a result these items were included in the questionnaire *Need for Leisure Support*. At least 75% of the professionals rated eight other items as belonging to the category 'Engagement in leisure activities' and these items were included in the questionnaire *Engagement in Leisure Activities*.

The questionnaire *Need for Leisure Support* consisted of eight items assessing participants' need for assistance in managing leisure (e.g. 'How often do you need assistance in *making leisure choices*?', 'How often do you need support in *managing boredom* during leisure time?'). Items were rated on a 5-point Likert-type scale ranging from 'almost never' (1) to 'almost always' (5). The higher the score, the more the participant needed support in his/her leisure management.

The questionnaire *Engagement in Leisure Activities* consisted of eight items assessing participation and variation in leisure activities (e.g., 'How often do you engage in *outdoor* activities during leisure time?', 'How often do you choose the *same* activities during leisure

time?"). Because normative data on frequency and variation of leisure activities are lacking, scores denoting 'regularly' (i.e., score 3) on a 5-point Likert-type scale were considered as being more adequate than scores denoted as 'almost never' (1), 'sometimes' (2), 'often' (4) or 'almost always' (5). For interpreting (changes in) scores, Likert-type scale scores were recoded as follows: scores on the frequency categories 'almost never' and 'almost always' were recoded as score '1', scores on the frequency categories 'sometimes' and 'often' were recoded as score '2', and scores on the frequency category 'regularly' were scored as '3'. The higher the recoded score on an item of *Engagement in Leisure Activities*, the more the participant engaged in this item on a regular basis (or, the lower the score on an item, the more extreme the engagement frequency on this item).

The questionnaire *Satisfaction with Leisure Lifestyle* consisted of 15 items measuring the degree of participants' satisfaction with his/her leisure lifestyle. The items of this questionnaire were based on items selected for the questionnaires *Need for Leisure Support* and *Engagement in Leisure Activities* and addressed for example participants' satisfaction with the way s/he arranges his/her leisure activities or participants' satisfaction with the frequency of his/her participation in leisure activities (e.g., gross-motor or club-activities). Items were rated on a 6-point Likert-type scale ranging from 'very satisfied' (5) to 'very dissatisfied' (0). The higher the score, the more the participant was satisfied with his/her leisure lifestyle. For each participant, percentage of satisfaction with leisure lifestyle was calculated by dividing the sum of the item scores by the maximum possible sum score (i.e., 75), multiplied by 100%.

The proxy questionnaire *Relative Reported Leisure* consisted of 16 items identical to the items of the self-report questionnaires *Need for Leisure Support* and *Engagement in Leisure Activities*. Items were rated on a 5-point Likert-type scale ranging from 'almost never' (1) to 'almost always' (5). With permission of the participants, a related person of each participant of the program group was asked to complete the scale at pre-test and at post-test. The relatives of five participants returned the questionnaire at pre-test and at post-test and one relative returned the questionnaire at pre-test only. Because of practical constraints, data of relatives of participants of the control group could not be collected.

#### *Program setting and materials*

The primary setting was a treatment facility serving high-functioning persons with ASD. Sessions were held in a room of a day treatment group for young adults. Next to this, six sessions of program I (see *Content of the leisure program*) and four sessions of program II



(see *Content of the leisure program*) were held in a public setting of the local community (e.g., café, bowling-alley, club). Furthermore, a session of program II was held in the living setting of one of the participants as part of his homework assignment aimed at inviting other participants to his home.

During the program, written instructions, task analyses, pictures, and visual cues were used. Furthermore, self-registration cards were used for evaluation of participants' leisure engagement (e.g., his/her experience with a range of leisure activities) and leisure management (e.g., arranging leisure activities). Next to this, each participant composed a leisure portfolio containing written and visual material intended to support him/her in leisure engagement and leisure management. The portfolio contained for example reviews of clusters of leisure activities and self-management strategies for skills such as making leisure choices, planning and arranging leisure activities, and solving problems in leisure. It also contained personal information regarding for example participants' preferences in leisure activities.

#### *Format of the leisure program*

The 6 month-leisure program consisted of 15 group sessions. Two staff members of the treatment facility participated as program leaders and they led the sessions under supervision of the first author. Sessions were held in the afternoon or in the evening at Fridays or Saturdays and lasted about 2.5 hours. Sessions were faded out from once a week (i.e., the first four sessions) to once in 6 weeks (i.e., the last two sessions). This was part of the generalization component of the program (see *Content of the leisure program*). Procedural strategies included the use of client-supported and self-management strategies, visual cues, common stimuli (e.g., program setting, use of real life exemplars), behavioral practice, and homework. Next to this, cognitive-behavioral techniques were used consisting of analyses of leisure lifestyle, positive feedback, and least-to most prompting in providing corrective feedback. During sessions, the program leader stimulated participants to share their real life experiences and to give each other feedback and support.

In general, each session consisted of seven components: (1) a warming-up in which participants could discuss leisure events that had occurred in the previous episode, (2) an evaluation of participant's homework whereby feedback was given by the other participants and/or program leader and problems in homework were discussed, (3) an introduction of the session's topic, in which the importance of the topic was discussed and, in case of leisure skills, the components of the skills were analysed, discussed and visualised, (4) a short break, (5) behavioral practice and feedback, in which skills were practiced using role-play exercises

(e.g., a role-play in inviting somebody and making an appointment to go to the movies, in calling a club and asking for information) or real life exercises (e.g., making a leisure plan for the next weekend, arranging a leisure activity with a mate), (6) an instruction in homework for the next episode, in which an appointment was made with each participant by the program leader for delivering support by mail or telephone, and, finally, (7) a brief evaluation of the content of the session.

### *Content of the leisure program*

The leisure program had five components: (a) introduction, (b) assessment, (c) leisure engagement, (d) leisure management, and (e) generalization. The seven participants in the program were assigned to two sub-groups. One sub-group of individuals ( $n = 4$ ) participated in a program that was focused on the component of *leisure engagement* (eight sessions) in which a range of possible leisure activities was examined (i.e., program I). The program of the second sub-group was focused on the component of *leisure management* (seven sessions) consisting of topics such as planning and arranging leisure activities (i.e., program II). Assignment to the sub-programs was based on preference of the participants. See Table 2 for the content of each sub-program.

During the *introduction* component of each sub-program, participants got acquainted with each other, the sub-program was explained, and its relevance was discussed.

During the *assessment* component of each sub-program, participants' leisure lifestyle was analysed regarding leisure engagement (program I) or leisure management (program II), participants' personal goals were determined, and the program content was determined by selecting topics of leisure engagement and/or leisure management that were raised by the participants themselves.

During the *leisure engagement* component of program I, a range of leisure activities was examined, for example yet unknown leisure activities such as visiting a fitness club, participation in leisure activities was evaluated, and leisure preferences were analysed. During the *leisure engagement* component of program II, information was given regarding the importance of participation and variation in leisure activities, preferences in leisure pursuits were analysed, and an unknown leisure activity was examined.

During the *leisure management* component of program I, information was given regarding the importance of planning leisure and arranging leisure activities, a strategy for leisure planning and arranging was introduced, and the strategy was practiced. During the

**Table 2.** Content of program I and program II.

Program component	Topics program 1	Topics program 2
Introduction	Acquaintance	Acquaintance
	Program method	Program method
	Participation and variation in leisure activities (2)	Planning and arranging leisure activities (2)
Assessment	Participant's leisure activities	Participants' leisure management
	Participants' aims	Participants' aims
	Determination program content (1)	Determination program content (1)
Leisure engagement	Introduction and examination of a range of leisure activities	Participation and variation in leisure activities
	Preference assessment	Preference assessment
	Implementation and evaluation (8)	Implementation and evaluation (2)
Leisure management	Planning and arranging leisure activities	Making leisure choices
	Implementation and evaluation	Planning leisure activities
	(2)	Arranging leisure activities Implementation and evaluation (7)
Generalization	Problem-solving	Problem-solving
	Fading out program support	Fading out program support
	Implementation and evaluation (2)	Implementation and evaluation (3)

NB. Numbers in brackets indicate number of sessions per program component.

*leisure management* component of program II, strategies for leisure planning, making leisure choices, and arranging leisure activities were introduced and analysed and the strategies were exercised using a variety of leisure activities.

During the *generalization* component of each sub-program, participants' leisure lifestyle in the previous episode was evaluated from self-registration cards. In program I, the

evaluation and feedback was focused on participant's use of his/her leisure time and on his/her involvement in various types of leisure activities. In program II, the evaluation and feedback was focused on participant's leisure planning, his/her leisure choices, and the way in which he/she had arranged his/her leisure activities. Next to this, leisure related problem-solving strategies were introduced and ways for leisure support from participants' support system were discussed. During the last session, the program was evaluated and a leisure group activity was planned a month later. For homework, participants of the sub-groups had to arrange this activity while the program leader delivered support by phone or mail when asked for by participants.

### *Acceptability*

During the last program meeting, a questionnaire was completed by the participants on the effectiveness and the acceptability of the program. It consisted of 20 questions regarding (a) effectiveness of the program on participants' leisure lifestyle, (b) acceptability of the content of the program, (c) acceptability of program procedures and material, and (d) acceptability of the organization of the program. Each question was rated on a 4-point Likert-type scale ranging from '1' (not at all) to '4' (very much).

### *Statistical analyses*

Data were analysed using *t*-tests for paired samples to examine pre-post changes for each group separately (within-group differences). Next to this, *t*-tests for independent samples were used to examine differences in pre-post changes between the experimental and control group (between-group differences). Estimates of effect sizes were calculated using Cohen's *d* (Cohen, 1992). It was hypothesized that program participants, relative to the participants who did not receive the leisure program, would (a) need less leisure support, (b) show a more regular leisure activity pattern, and (c) show more leisure satisfaction over time, following the program. Therefore, one-tailed analyses were performed to examine pre-post changes.

## **Results**

### *Need for leisure support*

Group means and other statistics for the eight items and the total score of the questionnaire *Need for Leisure Support* are depicted in Table 3.

Mean pre-test total scores for *need for leisure support* were 3.07 (range 2.57–3.86) for the experimental group and 2.58 (range 2.00–3.00) for the control group. Results of

**Table 3.** Mean pre-, post-test scores and other statistics on *Need for Leisure Support* of the experimental and the control group.

Items for leisure support	Experimental Group ( <i>n</i> = 7)				Control Group ( <i>n</i> = 5)				Experimental vs. Control		
	Pre-test <i>Mean (SD)</i>	Post-test <i>Mean (SD)</i>	Pre vs. Post <sup>a</sup> <i>t-Value p</i>	Pre vs. Post <sup>b</sup> <i>t-Value p</i>	Pre-test <i>Mean (SD)</i>	Post-test <i>Mean (SD)</i>	Pre vs. Post <sup>b</sup> <i>t-Value p</i>	Pre vs. Post <sup>b</sup> <i>t-Value p</i>	Group differences <sup>c</sup> <i>t-Value p</i>	Cohen's <i>d</i> <sup>d</sup> <i>p</i>	
Making leisure choices	3.29 (1.60)	1.57 (0.54)	3.03 .01*	3.03 .01*	2.20 (1.30)	2.20 (1.30)	0.00 .50	0.00 .50	2.10	.03*	1.23
Arranging leisure activities	3.14 (1.46)	1.71 (0.76)	2.97 .01*	2.97 .01*	2.60 (1.82)	2.00 (1.23)	1.18 .15	1.18 .15	1.16	.14	0.68
Executing leisure activities	2.57 (1.13)	3.00 (0.82)	-0.75 .24	-0.75 .24	3.00 (1.00)	3.60 (0.55)	-1.50 .10	-1.50 .10	0.23	.41	0.13
Initiating leisure activities	2.57 (1.51)	2.29 (1.38)	0.34 .37	0.34 .37	2.60 (1.82)	2.00 (1.41)	0.89 .21	0.89 .21	-0.27	.40	-0.16
Managing boredom	3.00 (1.73)	2.00 (0.00)	1.53 .09	1.53 .09	2.00 (0.00)	2.40 (1.52)	-0.59 .29	-0.59 .29	1.45	.09	0.85
Planning leisure during:											
Weeks	3.00 (1.41)	1.71 (0.49)	2.12 .04*	2.12 .04*	2.80 (1.10)	2.40 (0.89)	1.00 .19	1.00 .19	1.11	.15	0.65
Weekends	3.14 (1.57)	2.00 (0.58)	1.71 .07	1.71 .07	2.40 (1.14)	2.40 (1.52)	0.00 .50	0.00 .50	1.29	.11	0.76
Holidays	3.86 (1.46)	3.14 (1.46)	1.26 .13	1.26 .13	3.00 (1.41)	2.40 (1.52)	0.69 .26	0.69 .26	0.12	.46	0.07
Total score	3.07 (0.81)	2.18 (0.35)	2.57 .02*	2.57 .02*	2.58 (1.02)	2.43 (1.11)	0.33 .38	0.33 .38	1.32	.11	0.77

NB. Means on 5-point Likert-type scale scores: 1, almost never; 2, sometimes; 3, regularly; 4, often; 5, almost always.

<sup>a</sup> Test of pre-post test differences experimental group; all *df* = 6.

<sup>b</sup> Test of pre-post test differences control group; all *df* = 4.

<sup>c</sup> Test of group differences over time; all *df* = 10.

<sup>d</sup> Effect sizes for differences between independent means greater than 0.5 indicate medium effects and those above 0.8 indicate large effects (Cohen, 1992).

\* *p* < .05.

independent samples *t*-tests (two-tailed) indicated that there were no significant differences between the groups at pre-test. Mean post-test total scores were 2.18 (range 1.57–3.14) for the experimental group and 2.43 (range 2.00–3.60) for the control group, indicating a larger decrease in the need for leisure support in favour of the experimental group following the leisure program (Cohen's  $d = .77$ ). Within-group statistics for the experimental group show statistically significant decreases in need for leisure support after the program for the items *making leisure choices* ( $t(6) = 3.03, p = .01$ ), *arranging leisure activities* ( $t(6) = 2.97, p = .01$ ), *planning leisure during weeks* ( $t(6) = 2.12, p = .04$ ), and for the total score on *need for leisure support* ( $t(6) = 2.57, p = .02$ ). For the control group, no significant pre-post changes were found on need for leisure support. The estimated effect sizes of the between-group differences in pre-post changes indicate large effects for the experimental group regarding the decreases in need for support in *managing boredom* (Cohen's  $d = 0.85$ ) and *making leisure choices* (Cohen's  $d = 1.23$ ) following the program. For this last item, a significant effect was found for group,  $t(10) = 2.10, p = .03$ . Furthermore, medium effect sizes were found for the differences in changes over time, in favour of the experimental group, regarding need for support in *arranging leisure activities* (Cohen's  $d = 0.68$ ), *planning leisure during weeks* (Cohen's  $d = 0.65$ ), and *planning leisure during weekends* (Cohen's  $d = 0.76$ ). No significant changes or meaningful effect sizes were found in differences in need for support in *executing* and *initiating* leisure activities and in need for support in *planning leisure during holidays* over time.

#### *Engagement in leisure activities*

Group recoded means and other statistics for the eight items and the total score of the questionnaire *Engagement in Leisure activities* are depicted in Table 4. Recoded total scores on engagement in leisure activities indicate to what extent the participant has a regular leisure activity pattern. Participants' group scores on the items of the questionnaire *Engagement in leisure activities* are presented in Table 5, illustrating the actual leisure activity patterns of the experimental and control group.

Table 4 shows that mean pre-test *total* scores for *Engagement in leisure activities* were 1.82 (range 1.29–2.29) for the experimental group and 1.63 (range 1.00–2.20) for the control group, indicating that at pre-test most item scores were in the low or high frequency categories for both groups.

Table 5 shows that during pre-test, most of the participants of the experimental group and the control group had *high frequency scores* for engagement in *solitary activities* (i.e.,

'often' = 57% and 20% respectively; 'almost always' = 14% and 40% respectively) and *same activities* (i.e., 'often' = 14% and 40% respectively; 'almost always' = 72% and 40% respectively). For most participants in the experimental and the control group *low frequency scores* were found for engagement in *gross-motor activities* (i.e., 'almost never' = 57% in the experimental group, 'sometimes' = 80% in the control group) and *visiting clubs for persons with ASD* (i.e., 'almost never' = 57% and 80% respectively).

Comparisons of experimental and control groups' pre-test mean item scores using independent samples *t*-tests (two-tailed) indicated two significant differences between the groups. The mean score regarding engagement in *gross-motor activities* was significantly lower in the experimental group ( $M = 1.43$ ) compared to the control group ( $M = 2.20$ ) ( $t(10) = 2.63, p = .03$ ) and the mean score on *visiting regular clubs* was significantly higher in the experimental group ( $M = 2$ ) compared to the control group ( $M = 1$ ) ( $t(10) = 2.70, p = .02$ ). Regarding the latter, pre-test scores for the experimental group ranged from the frequency category 'almost never' to 'often', while 100% of the participants of the control group rated this item with the frequency category 'almost never' (see Table 5).

Within-group statistics for the experimental group show significant increases in mean item scores on engagement in *solitary activities* ( $t(6) = -1.99, p = .047$ ), and *same activities* ( $t(6) = -3.23, p = .01$ ), and the *p*-level regarding the difference for the mean item score on *gross-motor activities* strongly approached significance ( $t(6) = 3.03, p = .05$ ), indicating a trend towards a more regular engagement pattern on these items. Table 5 shows that for engagement in *solitary activities*, at post-test 72% of the participants had a frequency score of 'regularly', while only 14% of the participants had this frequency score during pre-test. For engagement in *same activities*, at post-test 86% of the participants had scores in the category 'often' (i.e., 72%), while during pre-test the frequency of engagement in this activity was mainly rated as 'almost always' (86%), indicating a trend towards 'regularly'. Regarding engagement in *gross-motor activities*, pre-post differences were mainly the result of a decrease in scores in the lowest frequency category (i.e., 'almost never' = 57% and 14%, respectively) and an increase of the scores in the frequency category 'regularly' (i.e., 0% and 29%, respectively). For the control group, no significant within-group differences were found on mean item scores for engagement in leisure activities. Differences in mean total pre-post scores on *engagement in leisure activities* were significant for the experimental ( $t(6) = -3.23, p = .01$ ) and the control group ( $t(4) = -2.67, p = .03$ ), indicating a general trend towards a

**Table 4.** Mean pre-, post-test recoded scores and other statistics on *Engagement in Leisure Activities* of the experimental and the control group.

Items for leisure engagement	Experimental Group (n = 7)				Control Group (n = 5)				Experimental vs. Control		
	Pre-test	Post-test	Pre vs. Post <sup>a</sup>	Pre vs. Post <sup>b</sup>	Pre-test	Post-test	Pre vs. Post <sup>b</sup>	Pre vs. Post <sup>b</sup>	Group differences <sup>c</sup>	Cohen's <i>d</i> <sup>d</sup>	
	Mean (SD)	Mean (SD)	t-Value		Mean (SD)	Mean (SD)	t-Value				t-Value
Solitary activities	1.86 (0.69)	2.57 (0.79)	-1.99	.05*	1.20 (0.45)	1.60 (0.55)	-1.63	.09	-0.66	.26	-0.39
Social activities	2.00 (0.58)	2.43 (0.79)	-1.44	.10	1.80 (0.45)	2.00 (0.00)	-1.00	.19	-0.58	.29	-0.34
In-home activities	2.29 (0.76)	2.29 (0.49)	0.00	.50	2.00 (0.00)	2.20 (0.45)	-1.00	.19	0.41	.32	0.24
Outdoor activities	2.29 (0.49)	2.29 (0.49)	0.00	.50	2.00 (0.00)	2.20 (0.45)	-1.00	.19	0.65	.27	0.38
Gross-motor activities	1.43 (0.54)	2.00 (0.82)	-1.92	.05	2.20 (0.45)	2.00 (0.71)	0.41	.35	-1.43	.09	-0.83
Visiting clubs											
Regular clubs	2.00 (0.82)	1.71 (0.49)	1.00	.18	1.00 (0.00)	1.40 (0.89)	-1.00	.19	1.44	.09	0.84
Clubs persons with ASD	1.43 (0.54)	1.57 (0.79)	-0.35	.37	1.20 (0.45)	1.20 (0.45)	0.00	.50	-0.26	.40	-0.15
Same activities	1.29 (0.49)	2.14 (0.38)	-3.29	.01*	1.60 (0.55)	2.00 (1.00)	-0.67	.27	-0.78	.23	-0.45
Total score	1.82 (0.25)	2.13 (0.29)	-3.23	.01*	1.63 (0.09)	1.83 (0.14)	-2.67	.03*	-0.81	.22	-0.47

NB. Means on recoded scores: 1, 'almost never' or 'almost always'; 2, 'sometimes' or 'often'; 3, regularly.

<sup>a</sup>Test of pre-post test differences experimental group; all df = 6.

<sup>b</sup>Test of pre-post test differences control group; all df = 4.

<sup>c</sup>Test of group differences over time; all df = 10.

<sup>d</sup>Effect sizes for differences between independent means greater than 0.2 indicate small effects, those above 0.5 indicate medium effects, and those above 0.8 indicate large effects (Cohen, 1992).

\* p < .05.



**Table 5.** Pre- and post-test Likert-type scale scores (percentages) on *Engagement in Leisure Activities* of the experimental and the control group

Items for leisure engagement	Pre-test <sup>a</sup>					Post-test <sup>a</sup>				
	1	2	3	4	5	1	2	3	4	5
Solitary activities	1. Experimental group	14	0	14	57	14	0	72	14	0
	2. Control group	40	0	0	20	40	0	0	60	20
Social activities	1. Experimental group	0	29	14	43	14	14	57	14	0
	2. Control group	0	80	0	0	20	0	100	0	0
In-home activities	1. Experimental group	0	14	43	29	14	0	0	29	71
	2. Control group	0	20	0	80	0	0	0	20	80
Outdoor activities	1. Experimental group	0	43	29	29	0	0	43	29	29
	2. Control group	0	100	0	0	0	0	80	20	0
Gross-motor activities	1. Experimental group	57	29	0	14	0	14	29	14	14
	2. Control group	0	80	20	0	0	20	40	20	0
Visiting clubs: Regular clubs	1. Experimental group	29	14	29	29	0	14	14	0	57
	2. Control group	100	0	0	0	0	80	0	20	0
Clubs persons with ASD	1. Experimental group	57	29	0	14	0	57	29	14	0
	2. Control group	80	20	0	0	0	80	20	0	0
Same activities	1. Experimental group	0	14	0	14	72	0	0	14	86
	2. Control group	0	20	0	40	40	0	0	40	40

NB. <sup>a</sup> 1, almost never; 2, sometimes; 3, regularly; 4, often; 5, almost always

more regular leisure activity pattern in both groups over time. The increase found in the experimental group (0.31) was larger than the increase found in the control group (0.20) and Cohen's  $d$  (-0.47) indicates a small effect size in favour of the experimental group. However, the actual increase in the mean total score on *engagement in leisure activities* of the experimental group at post-test was small (0.31), indicating that following the leisure program, still extreme frequency scores were found in the leisure activity patterns of the participants, especially regarding engagement in *in-home activities* (i.e., 'often' = 71%), *same activities* (i.e., 'often' = 86%), and *clubs for persons with ASD* (i.e., 'almost never' = 57%) (also see Table 5).

Results of between-group differences on engagement in leisure activities show large effect sizes over time on engagement in *gross-motor activities* in favour of the experimental group (Cohen's  $d = -0.83$ ) and on *visiting regular clubs* in favour of the control group (Cohen's  $d = 0.84$ ), indicating a more meaningful change towards regular engagement in gross-motor activities for the experimental group, while the change towards regularity in visiting regular clubs was more meaningful for the control group. In view of the direction of the changes, these large effect sizes may be the result of the significant pre-test differences found on these items in favour of the control group (i.e., *gross-motor activities*) and in favour of the experimental group (i.e., *visiting regular clubs*). In spite of the large effect sizes found for engagement in *gross-motor activities* and *visiting regular clubs*, no significant differences between groups were found on these items ( $p = .09$ ). Furthermore, only small effect sizes were found for between-group differences in changes in item scores over time. For three items, these effect sizes were in favour of the experimental group (i.e., engagement in *solitary activities*, *social activities*, and *same activities*) and for two items effect sizes were in favour of the control group (i.e., engagement in *in-home activities* and *outdoor activities*). Tentative findings of between-group differences indicate that the effects of the leisure program on changes in leisure activity patterns were limited.

#### *Satisfaction with leisure lifestyle*

Mean group percentage of leisure satisfaction for the program group increased from 45.71 ( $SD = 14.48$ ) at pre-test to 64.29 ( $SD = 5.96$ ) at post-test, indicating a statistically significant within-group change following the program ( $t(6) = -2.84, p = .02$ ). Mean group percentage of leisure satisfaction for the control group increased slightly from 51.40 ( $SD = 9.74$ ) at pre-test to 57.20 ( $SD = 19.87$ ) at post-test, though not significantly ( $t(4) = -5.56, p = .30$ ). Between-group statistics indicate a medium effect size for the pre-post change found in the program

group (Cohen's  $d = -0.64$ ); the difference in change was not significant ( $t(10) = -1.09$ ,  $p = .15$ ).

#### *Relative reported leisure*

Mean pre-post changes and other statistics on the 16 items of the Relative Leisure Report ( $n = 5$ ) are depicted in Table 6. No statistically significant changes in mean item scores on *need for leisure support* were found. However, although not significant, changes indicate decreasing trends in need for leisure support on six items following the program (except for *executing leisure activities* and *planning leisure during holidays*). Furthermore, no significant changes in mean item scores on *engagement in leisure activities* were found, although the change towards a more regular pattern of engagement in *same activities* was almost significant ( $p = .05$ ). Pre-post changes on the other items show trends towards more regular engagement patterns, except for *gross motor activities* and *visiting regular clubs* on which no changes were reported.

Comparing pre-post changes of the five relatives with pre-post changes of the five program participants, no significant differences in changes were found, although the difference in changes on need for leisure support in *making leisure choices* approached significance ( $p = .05$ ), indicating that program participants reported a more meaningful change following the program. In general, participants were more positive about their decreases in need for leisure support than their relatives. Only regarding *initiating leisure activities* relatives were more positive about the change in need for support compared to the participants ( $M_{\text{difference}} = 0.40$  and  $0.00$ , respectively). Both participants and their relatives indicated no changes in need for support on *executing activities*. Regarding changes towards regular patterns in leisure engagement, participants were, compared to their relatives, more positive about changes in *solitary activities* ( $M_{\text{difference}} = 0.60$  and  $0.40$ , respectively), *social activities* ( $M_{\text{difference}} = 0.40$  and  $0.20$ , respectively), and *gross motor activities* ( $M_{\text{difference}} = 0.80$  and  $0.00$ , respectively). However, relatives rated changes more positively regarding *in-home activities* ( $M_{\text{difference}} = 0.00$  and  $.60$ , respectively), and *outdoor activities* ( $M_{\text{difference}} = 0.20$  and  $0.40$ , respectively), whereas no differences were found on changes in *visiting clubs for persons with ASD* ( $M_{\text{difference}} = 0.40$ ) and engagement in *same activities* ( $M_{\text{difference}} = 0.80$ ).

The authors were also interested in the level of agreement in views about need for leisure support and leisure engagement between participants and their relatives at pre-test. Therefore, intraclass correlation coefficients (ICC), using one-way within-subjects ANOVA

**Table 6.** Pre-post changes on measures of *Need for Leisure Support* and *Engagement in Leisure Skills* on relative leisure reports and self-reports of five program participants: means, standard deviations and tests of changes.

Report Items	Relatives <sup>a</sup>	Pre vs. Post Relatives <sup>b</sup>		Participants <sup>a</sup>	Relatives vs. Participants <sup>c</sup>	
	Mean <sup>a</sup> (SD)	<i>t</i> -value	<i>p</i>	Mean <sup>a</sup> (SD)	<i>t</i> -value	<i>p</i>
<i>Need for Leisure Support</i> <sup>d</sup>						
Making leisure choices	0.80 (1.10)	1.63	.09	1.60 (1.14)	2.14	.05
Arranging leisure activities	0.40 (0.55)	1.63	.09	1.80 (1.30)	1.72	.08
Executing leisure activities	0.00 (0.71)	0.00	.50	0.00 (1.58)	0.00	.50
Initiating leisure activities	0.40 (1.14)	0.78	.24	0.00 (2.55)	-0.27	.40
Managing boredom	0.40 (0.55)	1.63	.09	1.00 (1.58)	1.18	.15
Planning leisure during:						
Weeks	0.60 (1.82)	0.74	.25	0.80 (0.58)	0.25	.41
Weekends	0.20 (1.48)	0.30	.39	1.00 (1.23)	1.21	.15
Holidays	-0.20 (0.84)	-0.54	.31	0.80 (1.48)	1.41	.12
<i>Leisure engagement</i> <sup>e</sup>						
Solitary activities	-0.40 (0.55)	-1.63	.09	-0.60 (1.14)	-0.27	.40
Social activities	-0.20 (0.45)	-1.00	.19	-0.40 (0.89)	-0.54	.31
In-home activities	-0.60 (0.90)	-1.50	.10	0.00 (1.23)	1.17	.15
Outdoor activities	-0.40 (0.55)	-1.63	.09	-0.20 (0.45)	0.54	.31
Gross-motor activities	0.00 (0.71)	0.00	.50	-0.80 (0.84)	-1.63	.09
Visiting clubs:						
Regular clubs	0.00 (0.71)	0.00	.50	0.20 (0.84)	0.30	.39
Clubs persons with ASD	-0.40 (0.89)	-1.00	.19	-0.40 (1.14)	0.00	.50
Same activities	-0.80 (0.84)	-2.14	.05	-0.80 (0.84)	0.00	.50

<sup>a</sup> Mean change from pre-test to post-test.

<sup>b</sup> Test of pre-post changes relative reports; all *df* = 4.

<sup>c</sup> Test of changes relative reports vs. self-reports; all *df* = 4.

<sup>d</sup> Mean changes on 5-point Likert-scale scores: 1, almost never; 2, sometimes; 3, regularly; 4, often; 5, almost always.

<sup>e</sup> Mean changes on recoded scores: 1, 'almost never' or 'almost always'; 2, 'sometimes' or 'often'; 3, regularly.

in SPSS procedure Reliability, were calculated for the self-report and relative reported scores for *need for leisure support* and *engagement in leisure activities*. Results on items of need for leisure support show a significant, moderate interrater agreement score (ICC = .69) on *making leisure choices* ( $F(5,6) = 5.47, p = .03$ ) and a significant, substantial interrater agreement score (ICC = .80) on *planning weekends* ( $F(5,6) = 9.07, p = .009$ ). Furthermore, fair (ICC  $\geq$  .40) interrater agreement scores on need for leisure support were found regarding the items *initiating leisure activities* (ICC = .53,  $p = .09$ ), *managing boredom* (ICC = .59,  $p = .07$ ) and *planning leisure during holidays* (ICC = .46,  $p = .13$ ). There was no agreement between participants and their relatives regarding participants' need for leisure support in *arranging* and *executing leisure activities*, and *planning leisure during weeks*, indicating more differentiations in perceptions. Results on items of engagement in leisure activities show a significant, moderate interrater agreement score (ICC = .71) on *in-home activities* ( $F(5,6) = 5.93, p = .03$ ). The moderate interrater agreement scores on *outdoor activities* (ICC = .63), *gross-motor activities* (ICC = .60), and *visiting regular clubs* (ICC = .60) approached significance ( $F(5,6) = 4.33, p = .05$ ,  $F(5,6) = 4.00, p = .06$ , and  $F(5,6) = 4.00, p = .06$ , respectively). No agreement was found regarding engagement in *solitary-*, *social-*, and *same activities*, and *visiting clubs for persons with ASD*, indicating more differentiations in perceptions on these items. Preliminary findings show that the level of agreement in perceptions between participants and their relatives on need for leisure support and engagement in leisure activities varies depending on the items rated.

#### *Acceptability ratings*

Participants rated the leisure program as effective ( $M = 3$ ) in improving their leisure lifestyle. All participants reported that they still needed support in managing their leisure and in initiating unknown leisure activities. Participants rated the content of the program as acceptable ( $M = 3$ ). The program components concerning leisure lifestyle analysis, participation in unknown leisure activities and arranging leisure activities were rated as most instructive ( $M = 3.3$ ). Behavioral practice and homework were rated as the most efficacious parts of the program package ( $M = 3.4$ ). Four participants reported that the program should include less "talking" and more behavioral practice in engagement in activities and managing leisure. They also reported that more leisure activities should be employed with their program group. Coaching by mail ( $M = 3$ ) was rated as more useful than coaching by telephone ( $M = 1.8$ ). Only one participant used the Portfolio ( $M = 1.4$ ) for planning and choosing activities,

the size of the portfolio (210 x 297 mm) was evaluated as being an obstacle in using it in natural situations. The organization of the program was rated as very good ( $M = 3.8$ ).

## Discussion

Although the leisure lifestyle of adolescents and adults with ASD is becoming more recognized as an important topic for treatment, studies on the effectiveness of interventions for improving leisure lifestyle of high-functioning youth with ASD are still lacking. Results of our preliminary study suggest that an outpatient group training program, consisting of client-supported strategies and cognitive-behavioral components, is effective in improving leisure lifestyle of high-functioning young adults with ASD living at home with their parents or at an (supported) independent setting.

Participation in the leisure program resulted in less need for support in leisure management skills, especially regarding *making leisure choices*, *arranging leisure activities*, *managing boredom*, and *planning leisure during week days and weekends*. Findings also show that participation in the program improved participant's *satisfaction with his/her leisure lifestyle*. Participants in the control group showed no significant changes on *need for leisure support* and *satisfaction with leisure lifestyle* over time and large-to-medium effect sizes were found in favour of the program group, with a significant effect for group on decrease in support needed in *making leisure choices* ( $p = .03$ ). However, results on need for leisure support suggest specificity of program effects as no (meaningful) changes were found on need for support in *executing and initiating leisure activities* and *in planning leisure during holidays*.

Findings on *leisure engagement* indicate that, compared to the control group, more regular leisure activity patterns were reported by program participants over time, especially regarding engagement in *solitary*, *gross-motor*, and *same activities*. However, findings on *leisure engagement* were less convincing than on *need for leisure support* due to significant group differences in scores on two items at pre-test and a trend towards a more regular activity pattern in the control group over time. Next to this, the actual total change on engagement in leisure activities in the program group indicated that participants still showed several extreme leisure activity patterns after completion of the program. For example, 86% of the participants still engaged 'often' in the *same activities*.

Relative reports on the leisure lifestyle of five program participants also indicated positive trends (though not significant) in decreases in need for leisure support and in changes in leisure engagement following the program. Comparing self- and relative reports on pre-post

changes, it shows that participants tend to rate their changes in need for leisure support more positively than their relatives, although no significant differences in perceptions of changes were found. Participants' motivation to participate in the leisure program (a requirement for selection), may have influenced their perception of gains made following the program (Tse, Strulovitch, Tagalakis, Meng, & Fombonne, 2007). However, this trend in differences between self- and relative reports on need for leisure support was not found for leisure engagement. Comparisons of perceptions on changes in leisure engagement revealed more differentiations than on changes in need for leisure support. It seems that the specific items of leisure engagement evoked more differences in perceptions on changes between participants and their relatives than the specific items of need for leisure support.

Preliminary findings on agreement between participants and their relatives on the 16 items measuring need for leisure support and engagement in leisure activities revealed fair ( $n = 3$ ), and (almost) significant, moderate ( $n = 5$ ) and substantial ( $n = 1$ ) levels of agreement. Results on agreement levels indicated differentiations in perceptions on need for leisure support in *executing* and *arranging leisure activities* and in *planning leisure during weeks*. Perceptions of the relatives were perhaps more accurate on these items, as it may be supposed that they actually delivered the support. Furthermore, it was found that on items measuring engagement in leisure activities differentiations were found in perceptions on engagement in *solitary-*, *social-*, and *same activities*, and in *visiting clubs for persons with ASD*. Participants themselves may have been more aware of their engagement in leisure activities than their relatives (Tse et al., 2007), although individuals may tend to underestimate or overestimate their performance due to social desirability issues (Kalyva, 2010). In this pilot study *perceptions* of leisure lifestyle were measured; in future studies it is recommended to use behavioral measures (e.g., self-registration) which can provide a more accurate profile of leisure lifestyle.

Findings on engagement in leisure activities of the participants confirm earlier findings that youth with ASD prefer engagement in the same, solitary, and in-home leisure activities and show a limited participation in formally organized recreational activities (clubs in the present study) (Brewster & Coleyshaw, 2011; Orsmond et al., 2004; Solish et al., 2010). The tentative findings suggest that the effectiveness of the leisure program was limited in increasing regularity in leisure activity patterns. Maybe the content of the questionnaire on leisure engagement was relatively insensitive in measuring changes in leisure engagement. Items on leisure activities and frequency ratings should then be made more specific. For example, in the study of Orsmond et al. (2004) frequencies of engagement in social and

recreational activities were measured using a Likert-type scale ranging from 'less than yearly or never' (= score 0) to 'at least once a week' (= score 3) and activities ( $n = 8$ ) were more specified in their study (e.g., 'socializing with friends', 'socializing with relatives', 'participating in group recreational activities', and 'working on a hobby') as compared to ours. Also Van Naarden Braun et al. (2006) specified items ( $n = 12$ ) in measuring leisure engagement (e.g., 'attending a club', 'going out to eat', 'going out to a movie', 'reading a book') and ratings on frequency were measured by asking the participant if s/he did the leisure activity in his/her free time over the past two weeks. Furthermore, behavioral content of the leisure program may need adjustments. Future research should investigate the effects of more intensive behavioral practice and feedback based on ABA techniques as these have shown to be effective in teaching adaptive skills to high-functioning adolescents with ASD (e.g., Palmen, Didden, & Arts, 2008). Next to this, program leaders reported difficulties in managing group interactions (e.g., topic management) in the leisure groups and in giving corrective feedback following least to most prompting procedures. In future research it is recommended to investigate effectiveness of behavioral skills training on performance of program leaders in leading the program and in giving feedback (see Palmen, Didden, & Korzilius, 2010). Future studies should also address procedural reliability of the training. Finally, the effectiveness of involving participants' natural support system in the leisure program should be investigated to promote generalization of skills practiced during the program, given the importance of providing leisure opportunities and structure at home to participate in leisure (Orsmond et al., 2004).

Participants' ratings on the effects and acceptability of the program were positive. Their indication that they still needed support in leisure following the program was consistent with the post-test findings on self-reports. Furthermore, participants expected that during the program they would employ more activities together with their program group. Although this was part of the behavioral practice component of the program, the main focus of the program was on the improvement of skills to engage in leisure activities in participants' natural living environment rather than on the provision of leisure opportunities. However, participants' expectation may indicate that they lacked leisure opportunities in their natural environment. This problem is more engaged with by persons with ASD living in the community who are not included in service settings than by persons with ASD living at home who are also included in service settings, or by persons living in 24hr-settings in which structured recreational activities often are provided by the facility (Orsmond et al., 2004).



There were several limitations of the study that need mentioning, including small sample size, absence of matched groups and random group assignment, and absence of relative reports on leisure lifestyle of participants of the control group. Our findings should be interpreted with caution. Problems in recruitment contributed to the limitations in that, for application for the program, participants needed more support by relatives than was expected. More personal recruitment efforts than websites and newsletters seem to be necessary to conduct a larger study and to realize matched groups and randomization.

Another limitation of the study is that data were collected through three self-report questionnaires and a proxy questionnaire that were developed for the purpose of this study, indicating that perceptions of participants' leisure lifestyle were measured and not participants' actual leisure behaviors. The use of relative reports next to self-reports gives additional information about the accuracy of self-reports, although differences in views may be the result of relatives being less aware of participants' leisure lifestyle than participants themselves (Tse et al., 2007). Next to this, in interpreting reports on leisure engagement, norms on frequency and variation of leisure activities were used considering scores denoting a 'regularly' frequency as most adequate scores. It remains to be assessed if extreme frequencies on the items of leisure engagement are truly 'negative' or undesirable. Furthermore, as no follow-up data were collected, no information is available on the level of maintenance of leisure changes over time. An additional limitation of this study is that, because of the small sample size, participants' data were not differentiated according to the leisure sub-program followed. As a result, it is not possible to compare the effectiveness of each sub-program on leisure lifestyle.

However, notwithstanding these limitations, the results of this preliminary study are promising. Based on our tentative findings and on the fact that a satisfactory leisure lifestyle has a positive effect on the quality of life of persons with ASD, further future research is warranted aimed at improving leisure lifestyle in young adults with ASD living at home or at an independent setting.

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## **Chapter 6**

### **Task engagement in young adults with high-functioning autism spectrum disorders: Generalization effects of behavioral skills training**

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**Abstract**

This study evaluated the effectiveness of a behavioral skills training package on task engagement in six young adults with high-functioning ASD who worked in a regular job-training setting. Experimental sessions were implemented in a small-group training format in a therapy room using unknown tasks. Data were collected on participant's off-task behavior and questions for help as well as on staff's behavior in the regular setting during regular job tasks (i.e., generalization). Intervention consisted of discrimination training, self-management strategies, behavioral practice, corrective feedback, and reinforcement. Following intervention, a significant decrease was found in percentage off-task behavior in the regular setting while performing regular job tasks. No changes were found in questions for help by participants or in behavior of staff. Effects were maintained at 6-week follow-up and at 6-month follow-up outcomes were still beneath baseline levels. Findings are discussed in relation to future research.

**Task engagement in young adults with high-functioning autism spectrum disorders:  
Generalization effects of behavioral skills training**

An important target in improving adaptive functioning in persons with autism spectrum disorders (ASD) is task engagement. Task engagement can be regarded as a pivotal response and is considered relevant in programming integration (e.g., Callahan & Rademacher, 1999; Pelios, MacDuff, & Axelrod, 2003; Ruble & Robson, 2007). Problems with task engagement in persons with ASD (with and without intellectual disability – ID) have been found in performing tasks across several domains. For example, in performing daily living tasks, play-, and leisure activities (e.g., Hume & Odom, 2007; MacDuff, Krantz, & MacClannahan, 1993; Machalicek et al., 2009; Pierce & Schreibman, 1994), and in performing academic tasks (e.g., Bouxsein, Tiger, & Fisher, 2008; Bryan & Gast, 2000; Coyle & Cole, 2004; Pelios et al., 2003; Ulke-Kurkcuoglu & Kircaali-Iftar, 2010; Watanabee & Sturmey, 2003), and employment tasks (e.g., Hume & Odom, 2007; Shields-Wolfe & Gallagher, 1992). Problems may manifest in various task-related behaviors such as, not using or not attending to task materials, using task materials in ways other than that for which they were designed, or engaging in inappropriate, not task-related, activities such as stereotypic behavior. Several factors may contribute to problems with task engagement in persons with ASD such as problems with self-regulation, maintaining attention, and/or problem solving (e.g., Ruble & Scott, 2002). Also, motivational challenges (e.g., Ulke-Kurkcuoglu & Kircaali-Iftar, 2010; Watanabee & Sturmey, 2003), problems in processing auditory information (e.g., Bryan & Gast, 2000; Massey & Wheeler, 2000), and problems in attending, initiating and generalizing skills (Carnahan, Hume, Clarke, & Borders, 2009) are considered contributing factors.

Task engagement has predominantly been targeted for intervention in studies with children with ASD in which self-management strategies (e.g., Callahan & Rademacher, 1999; Coyle & Cole 2004; Pierce & Schreibman, 1994), choice making opportunities (Ulke-Kurkcuoglu & Kircaali-Iftar, 2010), visual activity schedules (e.g., Bryan & Gast, 2000; Massey & Wheeler, 2000), and visual work systems (Hume & Odom, 2007) were effective in improving task engagement. In most studies, strategies were part of a treatment package including prompt fading and/or reinforcement procedures. Several studies reported that effects generalized over time (e.g., Coyle & Cole, 2004; Hume & Odom, 2007), across activities (e.g., Bryan & Gast, 2000), and/or settings (e.g., Pierce & Schreibman, 1994). For example, Pelios et al. (2003) examined the effectiveness of a treatment package consisting of an activity schedule, fading of instructional prompts and instructor's presence, delaying



reinforcement, and response cost on task engagement in three children (age range: 5-9 years) with autism and severe language deficits, performing familiar activities (i.e., academic and leisure activities) in an experimental setting. The treatment package resulted in substantial increases in on-task responding for all participants using activity schedules, with a supervisor only occasionally present. Results generalized across novel material, across a novel (experimental) setting, and over time.

Only a small number of studies have been conducted on task engagement in young adults with ASD. Interventions consisted of delivering choice making opportunities in ordering academic tasks in an activity schedule (Watanabee & Sturmey, 2003), teaching accurate use of an individual work system in performing employment tasks (Hume & Odom, 2007), and delivering specific task instructions (i.e., on task goal and on time frame) on academic tasks (Bouxsein et al., 2008). In these studies, one to three young adults with ASD participated of whom one was diagnosed with Asperger syndrome (Bouxsein et al., 2008). Most studies were conducted in the natural (i.e., academic or employment) setting and familiar tasks were used. Regarding generalization, maintenance of results was reported in only one study (i.e., Watanabee & Sturmey, 2003) while generalization across settings and/or tasks was not measured.

Many adults with ASD rely on support from parents and service agencies in transitioning across the lifespan (e.g., Howlin, Goode, Hutton, & Rutter, 2004). To achieve successful employment, demands for vocational services and supported employment increase substantially (e.g., Hillier et al., 2007; Lawer, Brusilovski, Salzer, & Mandell, 2009; Migliore, Timmons, Butterworth, & Lugas, 2012; Taylor & Seltzer, 2011). Research on work skills training for persons with autism is limited (Hendricks, 2010; Matson, Hattier, & Belva, 2012; Palmen, Didden, & Lang, 2012). As task engagement is considered a highly relevant work skill for integration in vocational settings (e.g., Hume & Odom, 2007), further research is needed on this subject. The above studies on task engagement in young adults with ASD had limitations in that no data were collected on generalization across settings and/or tasks. Due to generalization problems in persons with ASD, job skills training seems to be considered most beneficial when it is provided in the natural job-setting using regular tasks (see e.g., Hendricks, 2010; Lattimore, Parsons, & Reid, 2006). However, when using an experimental (simulated) setting, explicit programming of generalization is necessary to establish generalization (Koegel, Koegel, & Parks, 1995; Stokes & Osnes, 1989). In the simulation training by Lattimore et al. (2006), common stimuli (i.e., same trainer, same task materials and same procedure [i.e., graduated guidance]) were used in enhancing generalization in four

supported workers with ASD and ID (age: 29-32 years). The job-site training supplemented with the simulation training resulted in a more rapid job skill acquisition than did the job-site training alone.

Simulation-based training has also been effective in improving adaptive skills in the natural setting in young adults with high-functioning ASD. For example, Palmen, Didden, and Arts (2008) found that the use of silence prompts during tutorial conversations, supplemented with behavioral skills training in a simulated setting, resulted in a statistically significant higher level of question asking during regular tutorial conversations than the use of silence prompts alone in nine young adults with high-functioning ASD. The use of a self-management-strategy, visual cues, and multiple stimulus and response exemplars may have contributed to the generalization effects.

Given the importance of generalizing task engagement across a diversity of job tasks, the present study evaluated the effectiveness of a behavioral skills training package, implemented in a therapy room with unknown tasks, on task engagement in a regular job-training setting with regular job tasks (i.e., generalization setting), in six young adults with high-functioning ASD. As the occurrence of task engagement may be influenced by supervisor's presence, response prompting, and/or reinforcement contingencies (e.g., Pelios et al., 2003), data were collected on presence of staff and on staff's response prompting-, and reinforcing behavior toward the participant in the generalization setting to explore alternative explanations for improvement in task engagement by participants. Next to data collection by behavioral observations, data on off-task behavior were also collected by staff reports following each observation session to compare staff's opinion on the intervention with data of observation. Furthermore, a small group-training format was used as it gives the opportunity to involve more participants next to other benefits in terms of costs and learning opportunities. Finally, long-term follow-up data (i.e., 6 months following intervention) were collected as collection of maintenance data was limited in previous studies.

## **Method**

### *Participants*

The study was conducted in a treatment facility (Dr. Leo Kannerhuis) providing educational services such as domestic-, social-, leisure-, and job-skills training to persons with high-functioning ASD. Participants were six young adults who followed a regular job-training program at the training centre of the facility. The job-training program was conducted in 55 min sessions in which four to six clients participated. The purpose of the job-training program

was to improve participants' job-related skills such as improving technical job-skills or work rate, keeping appointments, greeting, or asking for help, and job-related tasks were used such as industrial-, catering-, craft-, or administrative tasks. During the job-training program, job trainers made use of verbal and/or visual task instruction, modelling, feedback, and/or reinforcement.

Participants were selected by their job trainer according to the following inclusion criteria: (a) client has a full-scale IQ of at least 70 and is at least 15 years old; (b) improving on-task behavior is a target in participant's job-training plan and only the regular job-training program is in effect on this target; (c) participant follows the job-training during at least 6 weeks; and (d) during the job-training verbal and/or visual instruction is given on job tasks. Following the first selection by job trainers, data on participants' off-task behavior were collected using 10 s partial interval recording during 30 min, in at least two job-training sessions. Participants should show off-task behavior in at least 25% of the observed time. Eleven clients fulfilled all of the above criteria and six clients wanted to take part in the study of whom one (i.e., participant 2) was female. The age of the participants ranged from 15 to 30 years ( $M = 19.6$ ) and their full-scale IQ ranged from 78 to 103 ( $M = 91.5$ ). Participation was on a voluntary basis and informed consent was obtained for each participant and his/her job-trainer, prior to the start of the study.

### *Setting and materials*

Data were collected in the regular job-training setting (i.e., generalization setting) in which the participant followed his/her job-training program. The job-training setting was a simulated workplace with an area of 20 to 36 m<sup>2</sup>. Four participants followed job-training in a simulated office setting (i.e., participants 3 to 6), one participant followed job-training in a simulated catering setting (i.e., participant 1), and one participant followed job-training in a simulated craftwork setting (i.e., participant 2). Experimental sessions were conducted in a 3 m x 7 m therapy room, a simulated workplace that was not used by the participants during their regular program. Participants and experimenter sat at a table that was positioned in the centre of the room. During intervention, the experimenter used a flowchart of the training procedure (see *Intervention*) to warrant accuracy of implementation. During discrimination training (see *Procedure*), 20 activity charts were used depicting off-task ( $n = 10$ ) and on-task ( $n = 10$ ) behaviors. Next to this, six 5 min videotapes of simulated work situations were used in which a young man was instructed by a female job trainer to engage in a job task and in which the man showed six examples of on-task behavior and four examples of off-task behavior. A

checklist was used to evaluate behavior as off-task or on-task, containing definitions of on-task and off-task behavior and two columns headed as 'on-task' and 'off-task', respectively. To promote generalization, a flowchart was used depicting the strategy for engaging in on-task behavior (see Figure 1) and 10 different work tasks were used that were not related to the job tasks during regular job training. The work tasks consisted of, for example, folding up 30 (tea-) towels, sorting different kinds of screws or sorting the content of files following visual directives, correcting grammatical errors in business letters, washing up cups and plates and making up tea trays, folding letters and addressing envelopes. Task analyses were used for 4 of the 10 work tasks. During observation, a recording sheet was used containing the definitions and examples of off-task behavior, 120 recording intervals, and five recording categories (see *Data collection and response definitions*). Finally, one mp3 player, two headphones, and an audiotape containing 10- and 5-s intervals were used.

#### *Data collection and response definitions*

Data were collected using a non-continuous 10 s/5 s (i.e., 10 s observing, 5 s recording) partial interval recording procedure. Observations were made during 30 min observational sessions, consisting of 120 intervals. Observation periods were scheduled between the 10<sup>th</sup> and 50<sup>th</sup> min of a job-training session; starting points of the observation periods were chosen at random. Data were collected on participant's 'off-task' behavior and 'questions for help' put to the job trainer; 'questions for help' were recorded as they were part of the strategy to engage in on-task behavior (see Figure 1). Next to this, data on the job trainer's behavior toward the participant were collected to explore alternative explanations for changes in participant's behavior. As the job trainer's behavior toward the participant and questions for help put to the job trainer could only appear in case the job trainer was present in the job-training setting, data on the presence of job trainers were also collected. Each interval was scored with respect to the presence (+) or absence (-) of each of below categories.

*Off-task behavior.* During at least three consecutive seconds, participant is (a) not engaged in the task that was instructed by the job trainer (e.g., registering on stock in stead of making coffee as instructed by trainer), (b) not visually attending to the task activity, the task instruction by the trainer, or the task instruction scripts (e.g., looking at a colleague), and (c) not manipulating the task materials as intended (e.g., ticking with scissors on the table instead of cutting out a pattern).

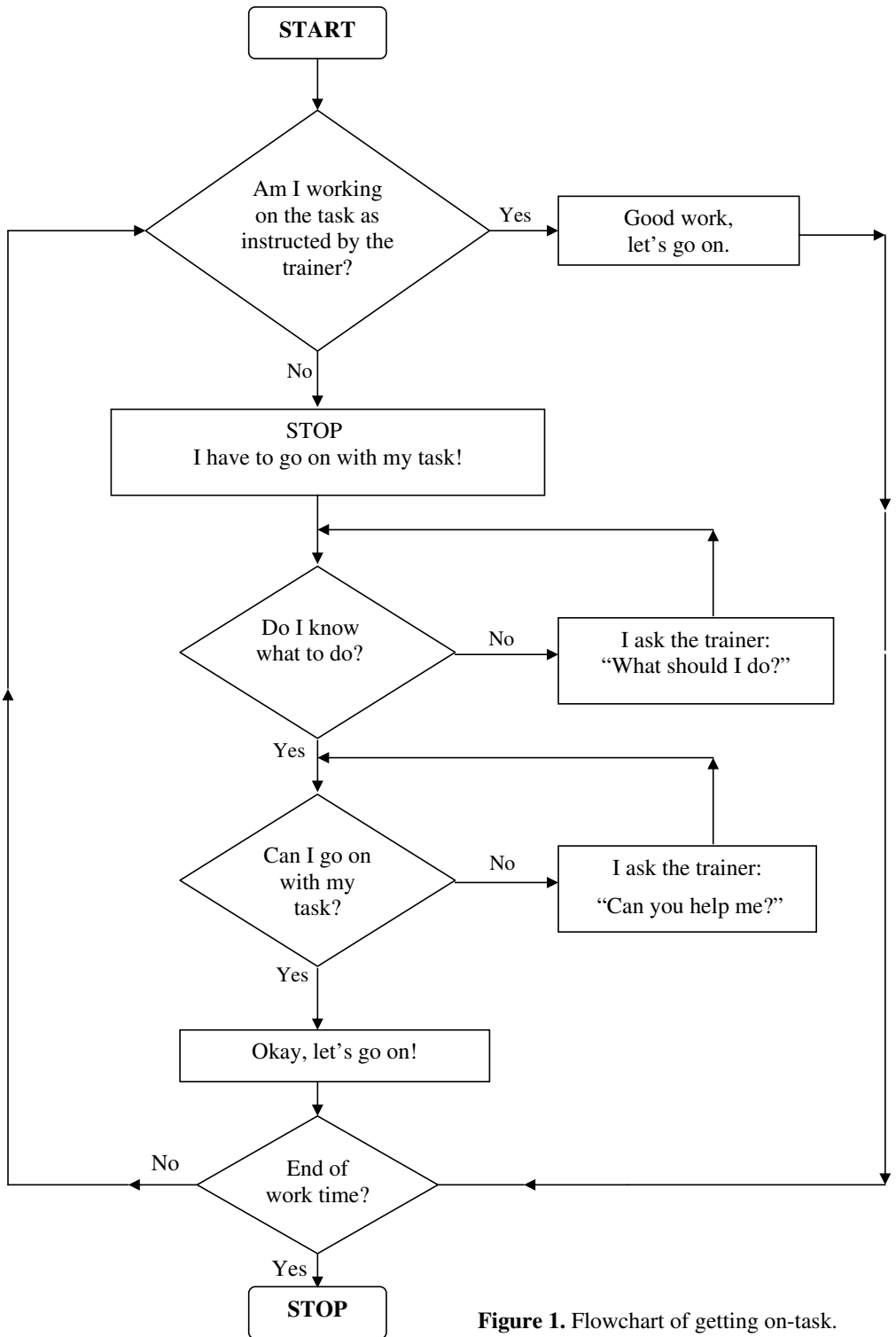


Figure 1. Flowchart of getting on-task.

*Presence of the job trainer.* The job trainer is present in the job-training setting.

*Question for help.* Participant asks the job trainer for assistance with the task (e.g., “Name trainer..., how do I adjust the tabs in the document?”, “..., what should I do?”, “..., can you help me?”).

*Response prompting.* The job trainer prompts the participant to provoke a correct task-related response using verbal instruction, gesturing, modelling, and/or physical guidance (e.g., “Name participant..., the water is boiling and you have to turn on the kitchen timer.”).

*Reinforcement.* The job trainer reinforces participant’s task-related behavior using positive consequences, praise or other positive comments (e.g., “That is great; you have already copied the invitations for the meeting.”).

### *Staff Reports*

To compare results of observational data to opinions by job trainers, data were also collected by job trainer reports completed following each job-training session during each condition, except for follow-up 2 (see *Design*). For the job trainer reports, a questionnaire was used containing three items: (1) ‘How often did the participant show off-task behavior during this session?’, (2) ‘How often did you use prompts to provoke correct task-related responses by the participant during this session?’, and (3) ‘How often did the participant ask for help during this session?’ Items were rated on a 6-point Likert-type scale ranging from ‘not at all’ (0) to ‘very often’ (5).

### *Reliability of recording*

At the start of the pre-baseline condition (see *Procedure*), a secondary observer received instruction on the definitions of the recording categories and the procedure of recording. During reliability observations, the secondary observer simultaneously but independently recorded at a distance of about 1-1.5 m from the primary observer; headphones of both observers were connected to the same mp3 player to ensure there were no differences in starting points of the recording intervals. Interobserver agreement was assessed on an interval-by-interval basis and was calculated by dividing the number of intervals with agreement on all recording categories by the total number of recorded intervals, multiplied by 100. Baseline data collection started after at least 80% interobserver agreement had been attained during three consecutive job training sessions in pre-baseline. Reliability checks were conducted during 20% of all observation sessions and were approximately equally distributed

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across baseline and intervention conditions and participants. The overall mean reliability across recording categories, participants, and conditions was 97% (range: 86-100%).

### *Dependent variables*

Dependent variables were participant's (a) off-task behavior and (b) questions for help during regular job training. The percentage 'off-task behavior' was calculated by dividing the number of intervals with off-task behavior by the total number of recorded intervals for that session, multiplied by 100. The percentage 'questions for help' was calculated by dividing the number of intervals with a question for help put to the job trainer by the total number of intervals in which the job trainer was present during the session, multiplied by 100.

Percentage of 'presence of the job-trainer', and of job trainers' 'response prompting'- and 'reinforcement' behaviors were calculated by dividing the number of intervals with the category by the total number of intervals in which the job trainer was present during the session, multiplied by 100.

### *Design*

Data were collected in a non-concurrent multiple baseline design (Watson & Workman, 1981) across three pairs of participants. The six participants were randomly assigned to the three baselines and the baseline condition was in effect for 4-6 weeks. The intervention was in effect for six weeks for the first two pairs of participants (participant 1-4) and for four weeks for the third pair of participants (participant 5 and 6). Following intervention, follow-up data were collected at 6 weeks during two or three observation sessions (i.e., follow-up 1). No follow-up data were collected for participant 5 as his job training program unexpectedly stopped following the third intervention session and data could not longer be collected. For three participants (participant 2, 4, and 6) follow-up data were also collected 6 months following intervention, during three to four observation sessions (i.e., follow-up 2).

### *Procedure*

*Pre-baseline.* At the start of the pre-baseline, which lasted at least four weeks, a 15 min meeting was held with the job trainers. During this meeting, they were globally informed about the study and instructed to conduct the job-training program as usual. Also, they were instructed on the report they should complete following each job-training session. Immediately following the meeting, the job trainers started with completing the report following each job-training session to get acquainted with this procedure and to control for

reactive effects of introducing the report. Furthermore, during at least eight job-training sessions per participant, (reliability) observations were conducted to control for a reactive effect of observation and to attain the criterion on inter-observer agreement (see *Reliability of recording*).

*Baseline.* Apart from the regular job-training program, no intervention was in effect on the targets of the study. Two weeks prior to the start of the intervention of a pair of participants, the experimenter held weekly 45 min sessions with the two participants of that pair. These sessions were conducted to control for reactive effects of increased attention on work items and conversations were held about general work topics such as participants' future job perspectives and their job-training program at the facility.

*Intervention.* Experimental sessions were held once a week in a group training format with two participants and lasted about 1 h. Each session consisted of four components: (1) introduction, (2) discrimination training, (3) self-management training, and (4) behavioral practice.

During the *introduction*, the aim of the intervention was explained to the two participants, the importance of task engagement was reviewed, and participants could discuss their experiences with task engagement during the job training and other situations involving on-task behavior (e.g., when executing domestic tasks). Next to this, the three criteria of on-task behavior were introduced on a sheet. These were (a) engaging in the task instructed by the job trainer, (b) visually attending to the task activity, the task instruction by the job trainer, or the task instruction scripts, and (c) manipulating the task materials as intended.

During *discrimination* training, each participant was instructed to evaluate 10 behaviors, depicted on 10 randomly selected activity charts (see *Setting and materials*) as off-task or on-task behavior using the three criteria of on-task behavior. The behavior described on the chart (e.g., "Reading instructions on your task script", "Looking at colleagues who are talking about their day off") should be evaluated within 5 s, then the experimenter asked the participant's colleague to help (in case of no response) or to evaluate the judgement as (in-) correct while using the three criteria. Correct judgements and/or evaluations were followed by praise by the experimenter. In case of incorrect judgements and evaluations, the experimenter conducted error correction while asking questions about the behavior (e.g., "Does the description of the behavior on the chart correspond with the criteria of on-task behavior?", "Are scissors intend to tick with it on a table?") and using the criteria. Next to this, the participants had to evaluate 10 examples of work behavior presented on a 5 min video segment (see *Setting and materials*). Following each example, the experimenter stopped the



video and instructed the participants to evaluate the behavior as on-task or off-task on a checklist. Correct evaluations were followed by praise; incorrect evaluations were corrected by the experimenter while asking the participant what kind of behavior the man displayed on the video. The video segment was shown again in case of no answer or an incorrect answer. Then the participant was asked to evaluate the same behavior again while the experimenter asked questions about the video segment and used the definitions on the checklist, for example “Was the man engaged in the task instructed by the trainer?”, “Which instruction gave the job trainer?”, “What was the man doing?”. Praise was given following a correct response. In case of an incorrect response, the experimenter asked the participant’s colleague for the correct response and if the colleague also omitted the correct response, the experimenter gave corrective feedback (e.g., “The job trainer instructed the man to clean the floor”, “The man stood at the window looking at a passing girl”, “...so the man was not engaged in the task instructed.”).

During *self-management* training, a flowchart (see Fig. 1) was introduced depicting the strategy for engaging in on-task behavior and role-play scenarios were used to practice the application of the strategy. During role-play, one participant worked on a task as (verbally and/or visually) instructed by the experimenter (e.g., “..., please fold up these 15 towels”). Questions for help were provoked by the experimenter withholding needed items (e.g., participant got only 12 towels). After 30 s, the participant in the role-play received a chart by the experimenter containing an instruction to show a specific off-task (e.g., “Clean your shirt with a towel.”) or on-task behavior (e.g., “Ask the trainer for help as you have only 12 towels to fold.”). After 10s, the participant not engaged in the role-play had to evaluate his or her colleague’s behavior as off-task or on-task on the checklist. Praise or corrective feedback was given as during discrimination training. Next, the participant in the role-play had to use the flowchart to get on-task again. In the first two intervention sessions, the experimenter immediately verbally instructed the participant to use the flowchart (“Now follow the instructions on the flowchart to get on-task again.”) and the participant had to read aloud the instructions and follow them. Starting with the third intervention session, a 5 s silence interval (Palmen et al., 2008) was used to provide the participant with an opportunity for initiating the use of the flowchart by his/her own to get on-task again. From this moment, the participant may also read the instructions silently. Correct responses were followed by praise and incorrect responses were followed by corrective feedback by the experimenter using the flowchart. During the role-play, the participant received six charts to show on-task ( $n = 3$ ) or off-task ( $n = 3$ ) behavior. Then the other participant engaged in a different role-play scenario.

During *behavioral practice*, each participant received a verbal and/or visual task instruction by the experimenter (instructions differed from the task instructions during role-play) and the instruction to work on the task during the remaining time of the session (i.e., at least 15 min). Participants were also instructed to use the flowchart to keep themselves engaged on the task. When the participants started working on the task, the experimenter started a stopwatch for each participant to register the time participant was working on his/her task. Every 30 s, the experimenter observed the participant's behavior during at least 3 s and registered the behavior as on-task or off-task. In case of off-task behavior, the experimenter stopped the stopwatch and waited 5 s for the participant to initiate the use of the flowchart to get on task again. In case of no initiation, the experimenter gave a verbal instruction to use the flowchart and the participant had to read (i.e., aloud during the first two sessions) and follow the flowchart instructions. The experimenter provided praise or corrective feedback as during self-management training. During correction, the other participant had to stay engaged on his/her task. If this was not the case, his/her stopwatch was stopped and the same procedure was started. Following correction, the experimenter recorded time on-task, started the stopwatch again, and continued observing the behavior of the participant, every 30 s implementing error correction in case of off-task behavior.

Five minutes before the end of the experimental session, the participants were instructed to stop working on the task. They were praised for their effort during the session. Furthermore, the recorded time of their on-task behavior was evaluated with the participants and compared to the results of the preceding intervention session. The participant was praised if the total time on-task had improved compared to the total time in the previous session. If the time on-task before the first instance of off-task behavior exceeded that of the previous session, the participant earned a tangible reward which had a worth of about three euro and which he could chose from a tray. During the first intervention session each participant earned a reward. Finally, the participants were instructed to take the flowchart to their regular job-training program and use it during their regular job-training sessions.

Following the first experimental session in the therapy room, the job trainer of the participant was informed about the flowchart that the participant was going to take to the regular job training. The job trainer was instructed to check if the participant had the flowchart with him/her and to instruct the participant at the start of the session to use the flowchart. The job trainer also received a copy of the flowchart for the participant in case the participant had forgotten it.

### *Social validity*

Within 2 weeks following intervention, the six participants and five job trainers (i.e., except the job trainer of participant 5) completed a questionnaire concerning the effects of the intervention and acceptability of the procedure. The questionnaire for the participants consisted of 9 items that were rated as 'yes' or 'no' (e.g., 'Did you find the behavioral practice useful to improve task engagement during intervention?', 'Did you improve your on-task behavior during regular job training as a result of intervention?'). The questionnaire for the job trainers consisted of 8 items of which each item was rated as 'yes' or 'no', or as 'intrusive' or 'not intrusive' (e.g., 'Did the participant improve in on-task behavior as a result of intervention?', 'How did you experience the observations during the job training sessions?').

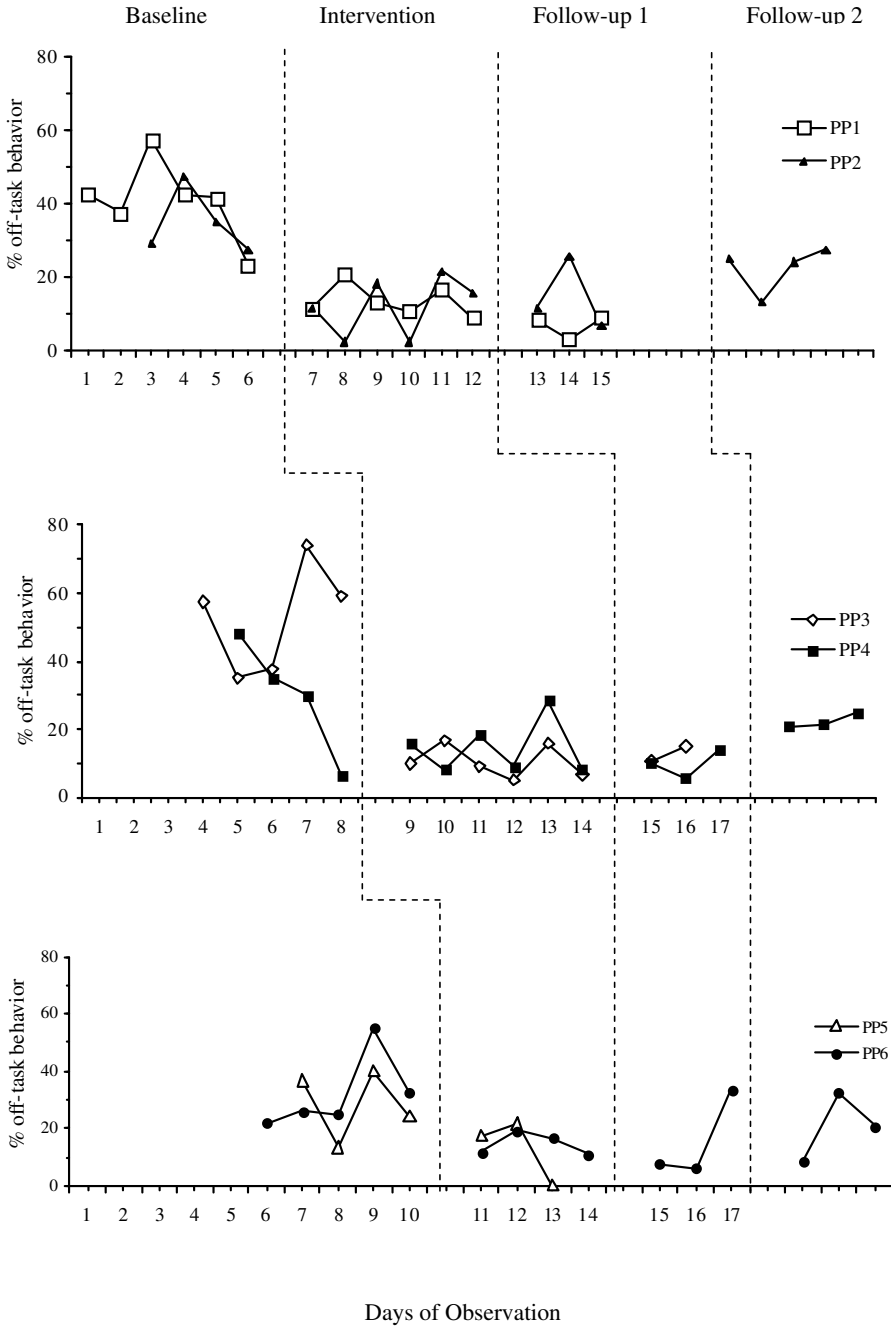
## **Results**

### *Off-task behavior during the regular job-training*

Figure 2 shows the percentage of intervals with 'off-task behavior' during the regular job training for the baseline, intervention, and follow-up conditions for each participant (also see Table 1). As participant 5 stopped participating in his job training program before the fourth experimental session, for him only three data points were collected during intervention and no data were collected during follow-up.

The overall mean percentage 'off-task behavior' was 36.5 during baseline and 13.2 during intervention. Given the decreasing trend in data of participant 4 during baseline (see Figure 2), baseline data were analysed for a decreasing trend using Time Data Analysis (TIDA), a time series data analysis program that takes into account serial dependency between scores (Oud & Bendermacher, 1998). Across participants, no decreasing trend in 'off-task behavior' was found during baseline ( $F(1,5) = .066, p = .806$ ). TIDA also tests for changes between adjacent experimental conditions and a statistically significant decrease in 'off-task behavior' was found during intervention compared to baseline ( $F(1,5) = 30.55, p = .003$ ).

During follow-up 1, the overall mean percentage 'off-task behavior' was the same as during intervention (i.e., 12%). Six months following intervention (i.e., follow-up 2), the overall mean percentage increased to 21.8; all participants showed more 'off-task behavior' as compared to intervention and follow-up 1. However, the means were still below baseline level.



**Figure 2.** Percentage of intervals with off-task behavior during baseline, intervention and follow-up at 6 weeks (i.e., follow-up 1) and 6 months (i.e., follow-up 2).

**Table 1.** Mean percentage of intervals with off-task behavior, standard deviations, and ranges for each participant during each condition.

P	Baseline			Intervention			Follow-up 1			Follow-up 2		
	M	SD	Range	M	SD	Range	M	SD	Range	M	SD	Range
P1	40.8	11.0	23-58	13.8	4.3	9-21	6.9	3.2	3-9	-	-	-
P2	35.0	9.1	28-48	12.1	8.1	3-22	14.7	9.9	7-26	22.5	6.3	13-28
P3	52.7	16.4	35-74	10.6	4.8	5-17	12.9	3.0	11-15	-	-	-
P4	30.0	17.4	7-48	14.7	7.9	8-28	10.0	4.2	6-14	22.5	2.2	21-25
P5	28.5	12.2	13-40	13.1	11.5	0-22	-	-	-	-	-	-
P6	32.0	13.4	22-55	14.6	4	11-19	15.6	15.4	8-33	20.5	12.1	8-33

NB. P, participant; M, mean; SD, standard deviation; -, no data collected.

Job-trainer reports on 'off-task behavior' revealed an overall mean score of 2.4 (range 0.8-3.7) during baseline. During intervention, the overall mean score decreased to 1.6 (range 1-2.2). During follow-up 1, the overall mean score was 2.1 (range 1-4). Results on reports were in accordance with results of observation except for follow-up 1 as reported scores for two of the five participants (i.e., participants 3 and 4) were above baseline scores.

#### *Questions for help put to the job trainer*

The overall mean percentage of 'questions for help' put to the job trainer was 4.4 (range 0.4-16.9) during baseline and 3.4 (range 1.5-6.1) during intervention. The change in mean was mainly the result of the change for one participant (i.e., participant 5) from a mean percentage of 16.9 during baseline to a mean percentage of 6.1 during intervention. The overall mean percentage of 'questions for help' for the other five participants was 1.9 (range 0.4- 4.5) during baseline and 2.8 (range 1.5-6) during intervention. TIDA revealed no statistically significant difference between baseline and intervention, neither for the test including 6 participants ( $F(1,5) = .059, p = .818$ ), nor for the test including 5 participants (i.e., excluding participant 5) ( $F(1,4) = 3.46, p = .136$ ). The overall means during follow-up 1 ( $M = 3.1$ , range 0.6-6.2) and follow-up 2 ( $M = 3.4$ , range 0-7.2) were similar to that during the intervention condition.

Job-trainer reports on 'questions for help' revealed a low overall mean score ( $M = 0.9$ , range 0-2.3) during baseline which increased to a mean of 1.5 (range 1-1.8) during intervention. Results on reports were in accordance with results of observations, indicating lower scores for participant 5 and slightly higher scores for the other five participants during intervention compared to baseline. During follow-up 1, the overall mean score was 1.1 (range 0.3- 2.7).

#### *Presence of the job trainer*

The overall mean percentage of intervals in which the job trainer was present was 71 (range 47-100) during baseline and 77 (range 34-97) during intervention. TIDA revealed no statistically significant difference between baseline and intervention on presence of job trainer ( $F(1,5) = .564, p = .487$ ), indicating that the significant decrease in participants' off-task behavior was not the result of an increased presence of the job trainer. During follow-up 1 and follow-up 2, the overall mean percentages of intervals in which the job trainer was present were 76 (range 22-100) and 70 (range 45-96), respectively, indicating that the presence of the job trainer remained stable across conditions.

*Job trainer behaviors*

*Response prompting.*

Table 2 depicts the mean percentage of ‘response prompting’ by the job trainer for each participant during each condition. The calculation of percentage of intervals with ‘response prompting’ was corrected for the number of intervals in which the job trainer was present.

The overall mean percentage of ‘response prompting’ was 11 during baseline and 12.6 during intervention. TIDA revealed no statistically significant difference between baseline and intervention ( $F(1,5) = .237, p = .647$ ), indicating that the significant decrease in participants’ off-task behavior was not the result of increased response prompting by the job trainer. During follow-up 1, the overall mean was 14.9. TIDA revealed no significant difference in ‘response prompting’ between intervention and follow-up 1 ( $F(1,4) = .283, p = .623$ ). During follow-up 2, the levels of ‘response prompting’ varied across the participants (see Table 2); the overall mean percentage was similar to baseline level ( $M = 9.9$ ).

Job-trainer reports on response prompting revealed an overall mean score of 2 (range 0.3-3) during baseline. During intervention, the overall mean score was similar to baseline ( $M = 1.7$ , range 1-2.2). During follow-up 1, no changes occurred in scores compared to baseline and intervention ( $M = 1.8$ , range 0.3-2.7). Results of reports were in accordance with results of observation.

*Reinforcement*

Results on reinforcement delivered by job trainers showed strikingly low percentages in each condition. During baseline, the overall mean percentage of intervals with reinforcement was 0.5 (range 0-1); two participants (i.e., participant 4 and 6) did not receive any reinforcement during this condition despite their correct task-related behavior. During intervention, almost identical percentages were found as during baseline ( $M = 0.5$ , range 0-1.5) and also during this condition participant 4 and 6 did not receive any reinforcement. Findings on reinforcement during baseline and intervention indicate that the significant decrease in participants’ off-task behavior was not the result of a change in providing reinforcement by the job trainer. During follow-up, overall mean percentages were around baseline and intervention level during follow-up 1 ( $M = 0.3$ , range 0-.8) and slightly higher during follow-up 2 ( $M = 0.9$ , range 0-1.9).

**Table 2.** Mean percentage of intervals with response prompting, standard deviations and ranges for each participant during each condition.

P	Baseline			Intervention			Follow-up 1			Follow-up 2		
	M	SD	Range	M	SD	Range	M	SD	Range	M	SD	Range
P1	14.4	4.6	8-21	13.4	6.2	4-24	14.9	17.4	4-35	-	-	-
P2	17.9	11.3	7-30	9.7	6.0	0-16	18.9	16.2	8-38	8.3	4.5	3-13
P3	16.1	15.1	4-42	12.9	10.1	1-28	9.9	7.9	4-16	-	-	-
P4	5.1	9.1	0-19	6.5	6.2	0-18	26.9	14	11-38	20.2	7.7	14-29
P5	11.0	10.3	0-25	15.8	18.6	1-37	-	-	-	-	-	-
P6	2.0	2.8	0-7	17.1	27.6	0-58	4.0	2.0	2-6	1.2	2.1	0-4

NB. P, participant; M, mean; SD, standard deviation; -, no data collected.



*Social validity*

Regarding the components of the intervention, participants were most positive about the self-management training and the behavioral practice in improving their on-task behavior. Four participants reported that their on-task behavior had increased as a result of intervention.

Participant 6 found that his on-task behavior was already on a high level preceding the intervention; however, compared to the other participants, his scores were in the middle range. One participant reported improving question-asking as a result of intervention.

According to the ratings by the job trainers of five participants following the intervention condition, two participants improved their on-task behavior as a result of intervention; however, this result was not in accordance with the results of job trainer reports on off-task behavior collected following each job-training session (indicating a decrease in off-task behavior during intervention compared to baseline). Four job trainers rated instructing the participant to use the flowchart (at the start of the session) as useful and not intrusive; one job trainer indicated that he almost never instructed the participant at the start of the session, because of other work duties. One job trainer experienced completing the report as intrusive. All job trainers rated the observations as not intrusive.

**Discussion**

The present study targeted task engagement in six young adults with high-functioning ASD and the percentage of off-task behavior was selected as the primary dependent variable. The study demonstrated that a time-limited behavioral skills training package, implemented in a therapy room, resulted in a statistically significant decrease in off-task behavior during regular job training. Furthermore, results were more or less maintained at 6-week and at 6-month follow-up. The significant decrease in 'off-task behavior' could neither be attributed to an increased presence of the job trainer nor to an increased use of response prompting or reinforcement by the job trainer as no significant changes between conditions were found on these variables. It can be concluded that the skill of remaining engaged with tasks generalized from the therapy room (using unknown tasks, under supervision of the experimenter) to the natural job-training setting while performing regular job-tasks under supervision of the regular job trainer. The use of self-management, a visual cue (i.e., flowchart), and behavioral practice using multiple stimulus- (e.g., verbal and/or visual task instruction on several unknown tasks) and response exemplars (i.e., several task engagement responses) may have contributed to the generalization effects (see e.g., Koegel et al., 1995; Stokes & Osnes, 1989).

Although ‘off-task behavior’ was the primary dependent variable, the skill of ‘asking for help’ was also selected as a dependent variable as this skill was part of the strategy to engage in on-task behavior. However, no significant change in asking for help was found between baseline and intervention. Throughout the study, low levels of ‘questions for help’ were found for most of the participants. There may be several reasons for this finding. First, we did not measure the opportunities for questions for help by the participants in the natural job-training setting and such data may be helpful in interpreting the findings. For example, in a study on staff performance in a naturalistic training setting aimed at improving question asking in youth with high-functioning ASD (Palmen, Didden, & Korzilius, 2010) also relatively low levels of questions for help were found and staff provided relatively few opportunities for participants to ask a question. Thus, low levels of opportunities in the natural job training setting may have resulted in low levels of ‘questions for help’ by the participants in that setting. Furthermore, as asking for help was just one part of the strategy for remaining engaged with tasks, more training trials explicitly addressing the skill of question asking may be necessary during the simulation training to improve the use of this skill in the natural setting.

As the use of staff reports in behavioral science has increased during the last decade (Baumeister, Vohs, & Funder, 2007) we were interested in the level of congruence between data of reports by job trainers and data of observation. We found that the trends in data of job-trainer reports were in accordance with the findings of observation, except for the reports on off-task behavior during follow-up 1 which indicated an increase for two participants to levels above baseline. A possible explanation for this disparity in findings between reports and observations is that the reports were reintroduced at follow-up 1 and that, as a consequence of the 6-week interval without reporting, the job trainers used other (i.e., more stringent) criteria to constitute their opinion compared to baseline and intervention (see e.g., Polkinghorne, 2005). Next to this, data on reports suggested that job trainer reports on participants’ ‘off-task behavior’ collected repeatedly under each condition were more congruent with observational data (i.e., decrease in off-task behavior in all participants) than reports only collected following the conclusion of treatment (i.e., decrease in off-task behavior in two participants). Our tentative findings on staff reports suggest that it is important to perform repeated measures in each experimental condition in studies using staff reports.

No significant change in response prompting by job trainers was found between baseline and intervention. Given the significant decrease in participants’ off-task behavior, a decrease in response prompting might have been expected. For example, in the study of Hume

and Odom (2007), the increase in on-task responding by the young adult with ASD was accompanied by a decrease in the teacher's use of prompts, whereby prompting was defined as a cue used to redirect the student's attention to the task. Our finding may be attributed to our definition of response prompting, as a correct instance of response prompting was not only recorded in case the job trainer corrected participant's off-task behavior but also in case the job trainer corrected incorrect on-task behavior (e.g., participant is buttering bread [= on-task] while the water of the eggs is boiling and he/she is instructed to turn on the kitchen timer). To study the relationship between an improvement in task engagement and a change in response prompting by staff, future research should discriminate between prompts delivered to correct off-task behavior and prompts delivered to correct incorrect on-task behavior.

No changes across conditions were found in job trainers' use of reinforcement. Overall, (near) zero percentages of reinforcement were found which is in agreement with results of the study by Palmén et al. (2010) who also found low levels of reinforcement by trainers despite the relatively high number of opportunities for providing reinforcement during training. It was suggested by these authors that staff beliefs about reinforcing students' behavior (e.g., according to some staff "reinforcement is 'artificial'") may function as setting condition, a topic on which further research is warranted. It seems that staff's use of reinforcement in naturalistic training settings for young adults with high-functioning ASD is limited and future research should target improving staff's use of reinforcement. The strikingly low levels of reinforcement provided by job-trainers may raise the question which variables are responsible for the decrease in 'off-task behavior' in the job-training setting. However, claims of stimulus generalization can only be made if "responses are emitted in the presence of novel stimuli by spread of effect without benefit of direct training" (Cuvo, 2003, p. 78). This seems to be the case in the current study, as systematic differential reinforcement and other forms of training were only part of the simulation-based training and generalization was measured under conditions different from conditions during simulation-based training. It is probable that self-management facilitated generalization and maintenance of effects, as use of self-management strategies may increase participants' attention towards their own behavior and enable participants to control their own behavior (see e.g., Coyle & Cole, 2004; Lee, Simpson, & Shogren, 2007).

Some shortcomings of the current study have already been mentioned. Additionally, it should be mentioned that no data were collected on procedural integrity; however, the experimenter used a flowchart of the intervention strategy to warrant accuracy of

implementation. Next to this, given the intervention package, it is unclear which intervention component is responsible for the results.

Task engagement is only one aspect of a range of work skill competences needed for the integration of young adults with ASD in vocational settings. Strategies are needed that build new work skills, facilitate maintenance of mastered skills, and increase work productivity and accuracy (Bennett, Brady, Scott, Dukes, & Frain, 2010). Despite some limitations of our study, the findings suggest that simulation-based training, incorporating behavioral analytic procedures, generalization strategies, and behavioral practice, offers an effective way of improving work skills in young adults with high-functioning ASD in natural settings.

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## Chapter 7

### **A personal digital assistant for improving independent transitioning in adolescents with high-functioning autism spectrum disorder <sup>1</sup>**

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**Abstract**

This study evaluated the effectiveness of a personal digital assistant (PDA) on independent transitioning between activities in a day treatment centre for youth with high-functioning ASD. Within a multiple baseline design across four participants, data were collected on participant's transitioning and staff's prompting behavior. Intervention by staff consisted of one technical instruction session on use of the PDA and non-specific instruction following incorrect transitions while not using the PDA, in the natural setting. Analysis revealed a significant increase in percentage independent daily transitions, which resulted from the independent use of the PDA. The change in staff's prompt use during intervention was mainly the result of a significant decrease in the use of non-specific prompts in correcting participant's transition behavior. A brief intervention was effective in improving independent transitioning using a PDA. Findings are evaluated in light of their clinical implications and suggestions for future research are discussed.

## **A personal digital assistant for improving independent transitioning in adolescents with high-functioning autism spectrum disorder**

Many individuals with autism spectrum disorder (ASD) manifest problems with transitioning. They may have problems with educational or life transitions such as transitioning from pre-school to kindergarten or from school services to adulthood (Forest, Horner, Lewis-Palmer, & Todd, 2004; Hendricks & Wehman, 2009). Transition problems in persons with ASD, however, have also been found in their daily functioning for example in transitioning between steps within an ongoing activity (e.g. Mechling, Gast, & Seid, 2009, Mechling & Savidge, 2011) or in transitioning between daily activities (e.g. Cihak, Fahrenkrog, Ayres, & Smith, 2010; Dettmer, Simpson, Myles, & Ganz, 2000).

Transitions between daily activities refer to progressing between different activities scheduled at school, work, or treatment centre (Banda, Grimmert, & Hart, 2009). Problems in this area contribute to individuals' limitations in independent functioning throughout the day as a supervisor is needed in supporting the transition from one activity to the next (Carnahan, Hume, Clarke, & Borders, 2009). In improving transition behavior in persons with ASD, the use of traditional prompting procedures may lead to dependency on adult-delivered prompts given their difficulties with prompt fading (MacDuff, Krantz, & McClannahan, 2001). Therefore, interventions targeting independent transitions between activities have focused on the use of (technical) visual supports such as picture or written prompts, activity schedules, video priming, or video modelling that do not require adult prompts as the supports themselves deliver the prompts (e.g. Banda & Grimmert, 2008; Cihak, 2011; Dettmer et al., 2000; Dooley, Wilczenski, & Torem, 2001; Schreibman, Whalen, & Stahmer, 2000). Such supports, however, often require ongoing supervision on participant's use of the supports, even after successful intervention (Cihak, 2011). This kind of supervision dependency may be inherent in the type of (technical) devices used in providing visual support to transition between activities (e.g., not portable).

In overcoming supervisor dependency in using visual supports, portable technical devices such as personal digital assistants (PDAs) may be a viable option. PDAs can be used as electronic task organizers, with each task linked to a reminder alarm (Gentry, Wallace, Kvarfordt, & Lynch, 2010) that may function as an auditory prompt to use the device and that therefore may decrease supervisor dependency. Additionally, as PDAs are popular consumer devices, the use of these 'cognitive' aids may carry no stigma and may be readily accepted by high-functioning youth with ASD (Gentry et al., 2010). Only a few studies have been

conducted on evaluating a PDA for improving independent transitioning throughout the day in youth with high-functioning ASD. Ferguson, Smith Myles and Hagiwara (2005) used a PDA for improving independency in managing and completing daily tasks, at home and at school, in a 14-year-old boy with Asperger's syndrome. During intervention, an alarm was set alerting him to start a targeted task and a reminder was displayed on the screen as a visual prompt. From baseline to intervention, mean percentages independent task completion (i.e., without adult prompts) improved from 0 to 47 for morning tasks (at home), from 63 to 87 for school tasks and from 23 to 33 for evening tasks (at home). Generalization may have occurred across types of tasks, as task completion increased during baseline in the third task type (i.e., evening tasks). Following intervention, adult prompts were still needed in initiating and completing daily tasks at home as well as at school. As no follow-up data were collected, it is not clear if results were maintained over time. Furthermore, Gentry et al. (2010) examined the efficacy of a PDA in managing daily tasks in 22 high-school students (age range 14–18 years) with ASD. Participants and their parents were taught how to make calendar and appointment entries, set reminder alarms, and make address book entries. Intervention consisted of one 90-min and three 60-min training sessions using modelling, instruction, and rehearsal. Intervention was followed by an 8-week post-training period. Pre–post data were collected using a semi-structured interview completed by participant and parent dyads. Comparison of pre–post scores revealed that, following post-training, statistically significant improvements were found in performance as well as in satisfaction with performance of everyday life tasks. However, results of this study should be interpreted with caution as a pre-experimental design was used, data were collected using self-assessment rating scales without reliability checks, and additional prompts provided by parents were not measured.

Given these limitations and the preliminary features of the studies on the efficacy of PDA's in decreasing dependency on adult prompts in youth with high-functioning ASD, further research is warranted on improving independent transition behavior using a PDA as a self-supporting tool. The aim of this study, therefore, was to examine the effectiveness of a PDA on independent transitioning between daily activities in a day treatment centre for youth with high-functioning ASD. Participants were taught to use a PDA that was programmed by their personal coach with reminder alarms and visual instructions on daily activities. A brief intervention procedure in teaching the use of the PDA was implemented by regular staff. It was assumed that the use of a PDA would also relieve staff in providing additional support in case of incorrect transitions. For this reason, data were also collected on staff's prompt use

during each condition. As previous studies did not present data on maintenance of results, follow-up data were also collected.

## **Method**

### *Participants*

Four clients of a day treatment facility serving youth and young adults (age range: 14–23 years old) with high-functioning ASD (i.e.,  $IQ \geq 70$ ) participated. Two of the participants were female (i.e., participant 1 and 4). One participant (i.e., participant 1) was 20 years old and the other three were 14 years old. One participant (i.e., participant 4) had a full-scale IQ of 140 and the full-scale IQ of the other three participants ranged from 84–86. Three participants (i.e., participants 2, 3, and 4) were members of the same day treatment group consisting of five clients.

Participants were selected by their staff to participate in the study because they were dependent on staff's prompts in transitioning between their daily activities and improving transition performance was a target in participant's treatment plan. For participation in the study, next to problems with transitioning, participants' day program had to contain at least five transition moments per day. Six clients were selected by their staff and, following this selection, data on prompt use in transitioning were collected using event recording during at least 3 days for each selected client. Data showed that staff prompts were used in at least 50% of the daily transitions for each of the selected clients. Next to this, more or less variable patterns in need for staff prompts were found. Given these findings, all selected clients (i.e., six) were asked for participation in the study. Although all of the selected clients complied with the request for participating in the study, two of the clients dropped out in the course of this study: one because of personal circumstances and the other because of an unexpected departure from the facility. Six regular staff members implemented the intervention and recorded transition behavior of the participants as well as their own prompt use in supporting participant's transition behavior. Participation was on a voluntary basis and informed consent was obtained for each participant and staff member prior to the start of the study.

### *Setting and materials*

Recording and intervention were conducted in the participants' living room and kitchen of the day treatment setting. As a portable PDA, an Apple iPod Touch 8 GB was used, with WIFI connection to software 'Coach2Care Agendacoach' developed by Rephrase Company (<http://www.re-phrase.com/nl/home.html>). To programme and use PDA-instructions online,

Google Calendar was used. In instructing staff on how to programme the PDA, a written instruction was used that provided staff with information on the technical use of the software; for example, how to enter instructions on daily activities and how to set reminder alarms. For each participant, a data recording sheet was designed that outlined participant's transition moments for each day of the week, start time for each transition, and categories of recording. During staff training, each staff member received a written description of the recording categories and the data recording sheets of each participant. Next to this, written scenarios and video-fragments of transition moments in the natural setting were used to practice recording. In practicing the implementation of the intervention procedure, each staff member received a flowchart of the procedure and role-play scenarios were used. In each staff's office, a flowchart of the intervention procedure and a sheet, depicting the definitions of the recording categories, were posted. In staff's office and/or the living room, public posting was used to prompt staff into recording transition moments. During participants' instruction on how to use the PDA in transitioning between activities, each participant received a written task-analysis of the steps.

#### *Daily transitions*

The transitions between daily activities were known to the participants prior to the study and had been part of their daily (individual) routine at the day treatment facility for at least 2 months. For each participant, a visual scheme was posted on a notice-board in the living room on which participant's daily activity-schedule (i.e., time, activity, and location per activity) was exposed in written text. This visual scheme was part of the regular support in the day treatment setting. The number of transitions for each participant per day ranged from five-to-eight and consisted of, for example, transitioning from group meeting to job-training or to training in social or daily living skills, from participation in education lesson to tutorial conversation, from leisure engagement to lunch preparation, from eating lunch to washing-up, and from group meeting to leaving for home.

#### *Recording*

Data were collected using event recording. For each participant, staff recorded at each transition moment which device(s) and/or staff prompt(s) were used for transitioning to the next activity. The following recording categories were distinguished: (a) *no help*: no device is used and no prompt is given by staff; (b) *PDA*: participant uses his/her PDA; (c) *visual scheme*: participant uses his/her visual scheme; (d) *confirmation prompt*: participant asks staff

for confirmation on the transition and staff answers the question with “yes” or “no” (e.g., “Do I have to go to job-training at this moment?”); (e) *non-specific prompt*: a (non-) verbal, non-specific prompt is given by staff (e.g., “Do you still have leisure time?”, staff points to visual scheme or PDA); (f) *verbal instruction*: a specific verbal prompt is given by staff (e.g., “It is time to leave for home”); (g) *modelling*: staff (partially) shows the participant how to transition (e.g., staff shows how to use the visual scheme); (h) *physical guidance*: staff (partially) accompanies the participant in his/her transition (e.g., participant transitions to the next activity in company with staff). Per transition moment more than one category could be recorded; for example, if a participant used his PDA as well as his visual scheme for transitioning, both categories were recorded. Next to this, at each transition moment staff recorded if the transition was made in time for the new activity (i.e., depending on the type of transition: initiated and completed within 2–10 min before the start of the next activity).

#### *Reliability of recording*

Reliability observations were conducted by a secondary observer (a university student majoring in Special Education). Interobserver reliability was assessed on a transition-by-transition basis and was calculated by dividing the number of transitions with agreement on all recording categories by the total number of recorded transitions, multiplied by 100. Baseline data collection started after at least 85% interobserver agreement had been attained during three successive observation days in pre-baseline. Reliability checks were conducted during 29% of all transition moments and were approximately equally distributed across conditions and participants. The overall mean reliability across recording categories, participants, and conditions was 93% (range = 87–100%).

#### *Dependent variables*

Dependent variables were participant’s (a) correct independent transitions (i.e., overall and specified per device type), (b) prompted incorrect independent transitions (specified per prompt type), and (c) unprompted incorrect independent transitions, per day. A correct independent transition was a transition in time for the new activity that was not prompted by staff, that is, participant used ‘no help’, a device (e.g., PDA), or a combination of devices (i.e., PDA and visual scheme) to transition in time. Additionally, data on the use of the specific devices in making correct independent transitions were specified. A prompted incorrect independent transition was an incorrect independent transition (i.e., no initiative in time for the new activity, an incorrect initiative [no transition-related behavior], or a correct initiative



not completed in time) that was followed by one or more staff prompts to correct participant's transition behavior. Data on prompted incorrect independent transitions were specified per prompt type. An unprompted incorrect independent transition was an incorrect independent transition (see above) that was not corrected by staff.

*The percentage correct independent transitions per day* was calculated by dividing the number of correct independent transitions by the total number of recorded transitions for that day, multiplied by 100.

*The percentage correct independent transitions per day for each device type, device combination, and 'no help'* was calculated by dividing the number of correct independent transitions for each device type/device combination/'no help' by the total number of recorded transitions for that day, multiplied by 100.

*The percentage prompted incorrect independent transitions per day for each prompt type* was calculated by dividing the number of prompted incorrect independent transitions for each prompt type by the total number of recorded transitions for that day, multiplied by 100. In case more prompt types were given at one transition moment, only the most intrusive prompt type was used in calculating the percentage. Intrusiveness of prompts was conceptualized according to the following least-to-most prompt hierarchy: confirmation prompt, non-specific prompt, verbal instruction, modelling, and physical guidance (Duker, Didden, & Sigafos, 2004).

*The percentage unprompted, incorrect independent transitions per day* was calculated by dividing the number of unprompted incorrect independent transitions by the total number of recorded transitions for that day, multiplied by 100.

### *Design*

A multiple baseline design across participants was used and the intervention was introduced at a different point of time for each participant. Baseline was in effect for 10, 17, 19, and 22 days across the 4 participants, respectively, and intervention was in effect for 11 days for each participant. Immediately following intervention, data were collected during a post-intervention condition that lasted 11 days for participant 1 and 10 days for the other participants. Follow-up data were collected during 3 days for participant 1 and participant 2, respectively 6 weeks and 4 weeks following post-intervention. Participant 3 had returned his PDA at follow-up (3 weeks following post-intervention) because he wanted to make the transitions on his own. For him, the condition at follow-up was the same as during baseline.

Participant 4 had unexpectedly left the treatment facility following post-intervention and follow-up data could not be collected.

### *Procedure*

*Pre-baseline.* During pre-baseline, staff first received instruction (verbal and written instructions, modelling, and practice) on how to use and programme the PDA, how to enter instructions for the participant on daily activities, and how to set alarms. Following this instruction, participant's personal coach (a staff member participating in the study) formulated the PDA scripts for each transition moment of the participant; the content of the scripts was adapted to participant's individual day program and individual prompting level on each transition moment. PDA scripts on daily transitions were formatted in (a) an instruction script that consisted of written instructions on the next activity and on preparations that should be made (e.g., 'It is time to leave for education lesson. Do not forget your pen-and-paper and education books. Have a nice time. '), or in (b) a conversation script that consisted of written instructions, questions, and answer alternatives (e.g., 'It is time to leave for education lesson. Take your pen-and-paper and education books.', 'Did you take your pen-and-paper and education books?', *Yes* → 'That is great, now you can leave for school, have a nice time.', *No* → 'Do you know what education books you need?', etc.). Each script ended with a positive comment (e.g., 'Well done.', 'Have a nice time.'). In composing scripts, each personal coach received written feedback on at least six scripts. Alarms for a transition moment were set on the maximum start time for that specific transition minus 1 min (i.e., if a transition for the activity could be started 5 min before the start of that activity, the alarm was set on 4 min before the start of that activity) to give the participant the opportunity to initiate the transition by him/herself.

Furthermore, during a period of 10 weeks, five staff meetings were held in which staff received training on data collection. Each meeting lasted 45 min and consisted of (a) verbal and visual instruction on the definitions of the recording categories, (b) practicing in interpreting and recording transition behavior of participants and prompting behavior of staff, and (c) evaluating data collection during practices in the natural setting. Following the second staff meeting, staff started data collection in the natural setting and data were collected on reliability of recording.

*Baseline.* During baseline, neither the PDA nor the intervention was in effect and the regular staff prompts and/or the regular device (i.e., visual scheme) were used in supporting participant's transitioning between activities.

*Pre-intervention.* Two days before the start of the intervention phase, staff received training on how to implement the intervention procedure during a staff meeting of 45 minutes. Training consisted of (a) verbal and visual instruction using the flowchart of the intervention procedure, (b) practice using written and role-play scenarios of transition behavior of clients (not) using a PDA at transition moments, and (c) feedback on practice, using the flowchart. At the first day of the intervention, but prior to the first transition moment of the participant, verbal staff instruction on the procedure was provided using the flowchart.

At the end of the day preceding the first day of the intervention, participant was instructed by his/her personal coach on how to use the PDA in transitioning between activities. Instruction lasted 30 min. First, a rationale was provided for using the PDA. Next to this, verbal and written (task-analysis of the steps) guidelines and modelling were used in teaching how to use the PDA. Then, participant was given his/her PDA to practice how to use the PDA following the auditory alarm, that is, how to activate the ‘Coach2care Agendacoach’-link that emerged on the screen following the alarm, how to scroll through an instruction script, and how to answer the questions in a conversation script using the touch screen. While practicing, the personal coach provided verbal or gestural prompts as needed. Following the instruction session, the PDA alarm was activated on the last transition moment of that day (at the maximum start time) and the use of the PDA by the participant was briefly tested under supervision of the personal coach. All participants could use their PDA adequately during this test; two participants (i.e., participant 1 and 2) asked the coach for confirmation on their use of the PDA and no error corrections were needed during the tests.

*Intervention.* During intervention, the participant was in possession of a PDA. Following an auditory PDA alarm, staff waited 10 s for a transition initiative by the participant. In case the participant made a correct initiative (i.e., transition-related behavior) within 10 s following the PDA alarm and completed the transition in time for the new activity without staff prompts, staff reacted as usual in the case of a correct initiative and/or completion (e.g., “Have a nice time.”, “Ok, you are leaving for ...”, “Good action”, or no reaction). In case the participant made an initiative within 10 s following the alarm *while using the PDA script*, but the initiative was incorrect (i.e., no transition-related behavior) or the participant was not completing the transition in time for the new activity, regular staff prompts (as during baseline) were given (e.g., “It is time to leave for education lesson. Did you take your pen-and-paper and education books?”, “You are late for education lesson, you have to hurry up.”). In the case of no initiative or an incorrect initiative within 10 s following the alarm *while not using the PDA script*, staff gave a non-specific prompt to use the PDA (e.g., “Was that the

alarm of your PDA?” or staff points to participant’s PDA). In cases where the participant made a correct initiative within 10 s following the alarm *while not using the PDA script*, but was not completing the transition in time for the new activity, staff also gave a non-specific prompt to use the PDA (e.g., points to participant’s PDA and says “You have to hurry up.”). In cases where the non-specific prompt to use the PDA was not followed by a correct initiative and/or transition completion, regular staff prompts (as during baseline) were given. If the non-specific prompt to use the PDA was followed by a correct initiative and/or transition completion, staff reacted as usual in cases of a correct initiative and/or transition completion.

During 2 days of the intervention phase, staff received individual verbal feedback on the implementation of the procedure, using the flowchart. Next to this, groupwise evaluation of the implementation of the procedure took place during two regular staff meetings.

*Post-intervention.* During post-intervention, the participant was in possession of a PDA. As participants still needed staff prompts in transitioning following intervention, staff continued using prompts in eliciting the use of the PDA. However, as the intervention phase had stopped, staff used several types of prompts in eliciting the use of the PDA by the participant. To control for changes in participant’s transition behavior and staff’s prompting behavior following intervention, data collection was continued during 10–11 days.

*Follow-up.* During this phase, participants 1 and 2 were in possession of a PDA and participant 3 had returned his PDA.

#### *Procedural reliability*

The secondary observer also collected data on the following procedural components of the intervention procedure: (a) in cases of the PDA alarm: staff waits 10 s for an initiative by the participant to transition to the new activity, (b) in cases of no initiative following the alarm, an incorrect initiative, or no completion in time while not using the PDA: staff gives a non-specific prompt to use the PDA-script, and (c) in cases of no or an incorrect initiative despite the non-specific prompt or in cases of an incorrect initiative or no completion in time with use of the PDA: staff gives the regular prompt(s) that control(s) the transition behavior of the participant. Procedural reliability observations were conducted during 37% of all transition moments during intervention and were approximately equally distributed across participants. Procedural reliability was calculated by dividing the number of events a procedural component was emitted as planned by the number of opportunities to emit that component, multiplied by 100 (Billingsley, White, & Munson, 1980). Mean procedural reliability across

the three procedural components was 92% (range 83–100) for participant 1, 98% (range 94–100) for participant 2, 75% (range 33–100) for participant 3, and 78% (range 38–100) for participant 4. Procedural errors consisted of errors in which staff omitted to wait 10 s for an initiative by the participant and presented the non-specific prompt within 10 s following the PDA alarm, and errors in which staff omitted to give the non-specific prompt to use the PDA and presented the regular controlling prompt. Errors of this last type resulted in the lower procedural accuracy measures for participants 3 and 4 compared to participants 1 and 2.

### *Social validity*

Within 2 weeks following post-intervention, participants and staff completed a questionnaire concerning the effects of the intervention and the acceptability of the procedure.

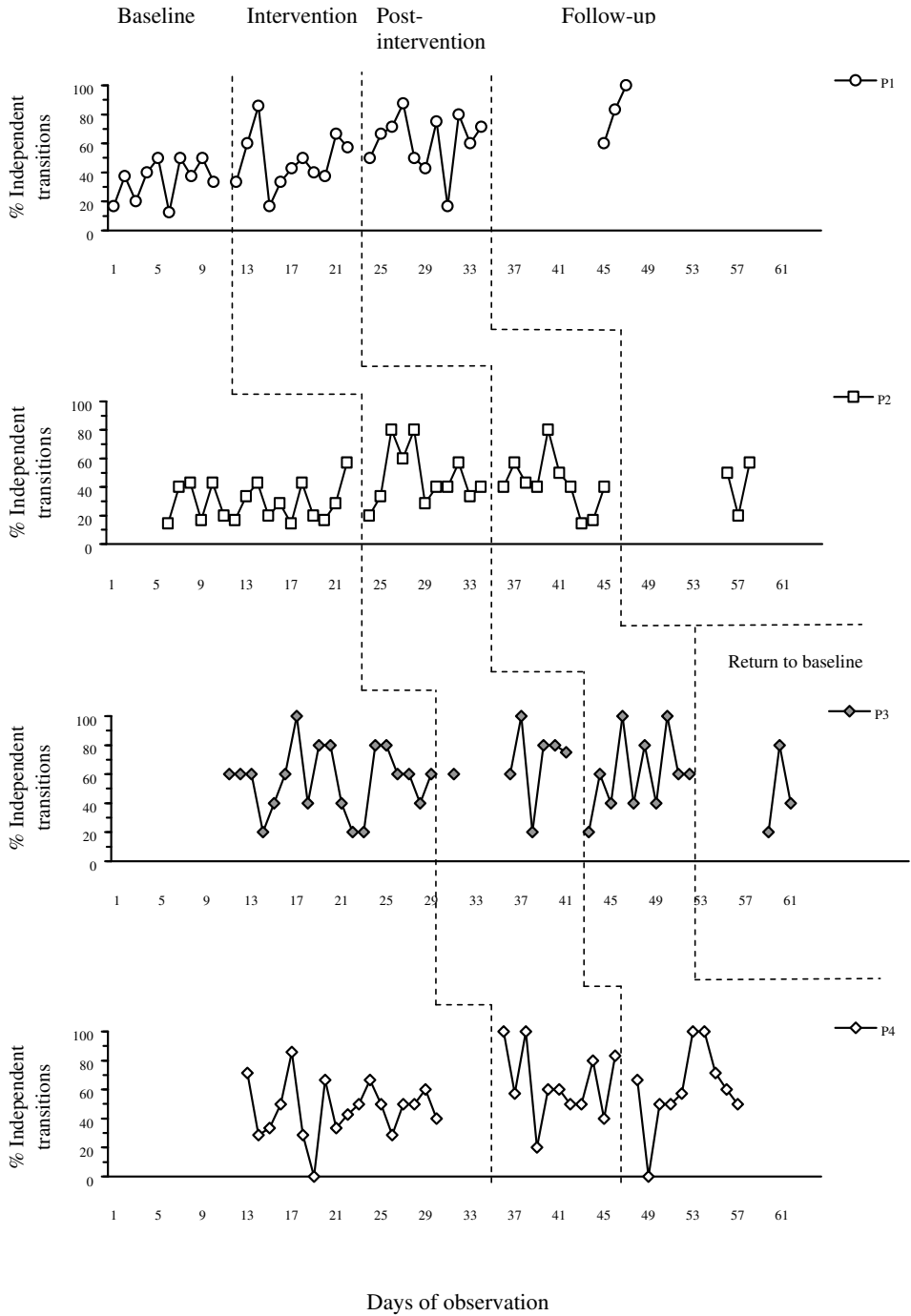
The questionnaire for participants consisted of 10 questions that were rated on a 5-point Likert-type scale ranging from 1 ('not at all') to 5 ('very much') (e.g., 'Does the PDA help you to fulfil your daily activity schedule in time?', 'Do you need less assistance from staff in following your daily activity schedule, since you use your PDA?'). The questionnaire for staff consisted of 18 items that were rated on a 4-point Likert-type scale ranging from 1 ('not at all') to 4 ('very much') (e.g., 'Since the use of the PDA, participants need less adult prompts in transitioning than before.', 'The flowchart was an effective tool in teaching how to implement the intervention procedure.').

## **Results**

### *Percentage correct independent transitions per day*

Figure 1 shows the percentage of correct independent transitions per day, for each participant during each condition (see also Table 1). Because of unexpected organizational problems by staff in recording transition behavior, no data were collected for participant 3 during four days (days 2–5) of his intervention phase and for participant 4 during the last 4 days of her baseline.

The overall mean percentage was 42 during baseline and 56 during intervention and post-intervention. During baseline, the percentages showed a highly variable pattern for participants 3 and participant 4. During intervention and post-intervention, the percentages showed a highly variable pattern for all participants. During post-intervention, the mean percentage correct independent transitions further increased for participant 1, while the percentages of the other participants slightly decreased compared to intervention. During follow-up, there was a further increase in the percentages for participant 1, while the



**Figure 1.** Percentage correct independent transitions per day for each participant during each condition.

**Table 1.** Mean percentage correct independent transitions per day, standard deviations, and range for each participant during each condition.

P	Baseline			Intervention			Post-intervention			Follow-up		
	M	SD	Range	M	SD	Range	M	SD	Range	M	SD	Range
P1	35	14	13-50	48	19	17-86	61	20	17-88	81	20	60-100
P2	29	13	14-57	47	20	20-80	41	19	14-80	43	20	20-57
P3	56	23	20-100	68	25	20-100	60	27	20-100	47*	31	20-80
P4	46	20	0-86	63	25	20-100	61	28	0-100	-	-	-

NB. P, participant; M, mean; SD, standard deviation.

\*Condition during follow-up is the same as during baseline.

percentages stabilized for participant 2. Participant 3 did not use his PDA anymore during follow-up and his mean percentage decreased to below baseline level.

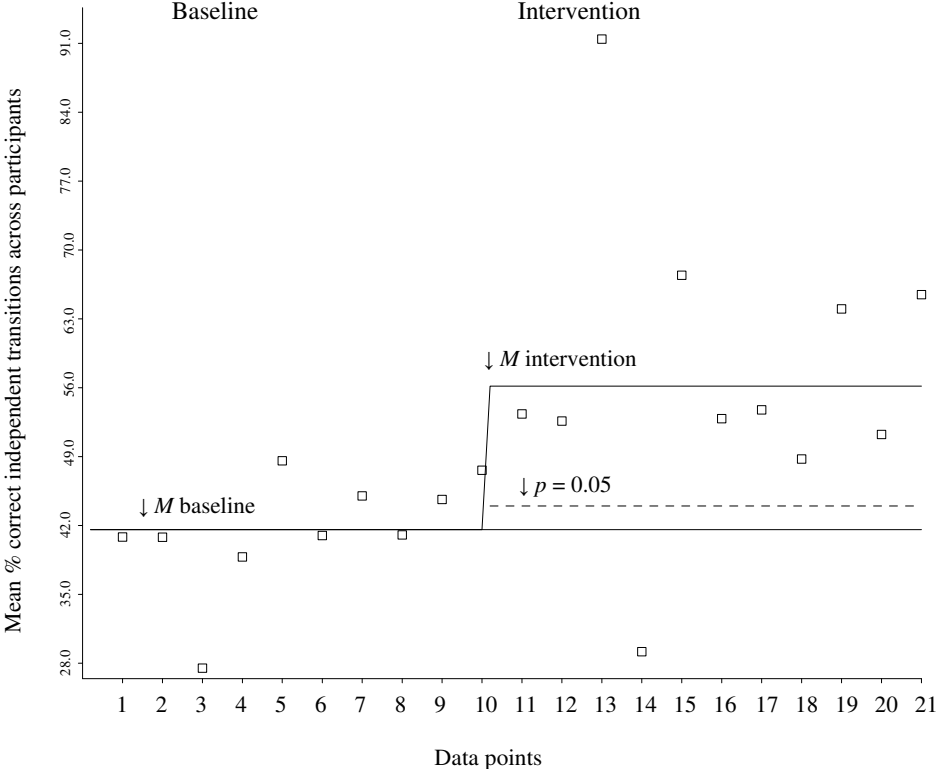
Given the variable pattern in data during baseline, baseline data were analysed for a trend using Time Data Analysis (TIDA), a time series data analysis program that takes into account serial dependency between scores (Oud & Bendermacher, 1998). Across participants, no trend in percentage correct independent transitions was found during baseline ( $F(1,3) = .57, p = .50$ ). TIDA also tests for changes between adjacent experimental conditions and a statistically significant increase in percentage correct independent transitions was found between baseline and intervention ( $F(1,3) = 203.87, p = .0007$ ). As for TIDA the same number of data points needs to be used for each participant in the same experimental condition, during baseline the last 10 data points were used for each participant and during intervention 11 data points were used per participant; the four missing data points of participant 3 during intervention were completed with the mean of the collected data points during intervention. Figure 2 shows the TIDA plot of data point means across participants during baseline ( $n = 10$ ) and intervention ( $n = 11$ ).

Given the variable pattern in data at the individual level, also the Nonoverlap of All Pairs (NAP; Parker & Vannest, 2009) was calculated for each participant. The NAP is a measure of effect size and can be used to summarize data overlap between each baseline data point and each intervention data point. The NAP has been regularly used in reviews in evaluating outcomes of single-case research design studies (e.g., Ramdoss et al., 2012). NAP scores range from .5–1; if data points from two phases cannot be differentiated then NAP = .5 (i.e., 50% chance that scores from one phase will exceed those of the other). For participants 1, 2, and 4, NAP scores were .69, .74, and .70, respectively, which can be classified as medium effect sizes according to the interpretation guidelines of Parker & Vannest (2009) (i.e., range medium effects = .66–.92). For participant 3, the NAP score was .65 indicating a small-to-medium effect size (range small effects = 0–.65).

*Percentage correct independent transitions per day for each device type, device combination, and 'no help'*

Table 2 depicts the mean percentage of correct, independent transitions per day for each device type, device combination, and 'no help' for each participant during each condition. The overall mean percentage transitions performed with 'no help' was 39 during baseline and 27 during intervention. TIDA revealed that this change was not statistically significant ( $F(1,3)$





**Figure 2.** Overall mean percentages of correct independent transitions across data points during baseline ( $n = 10$ ) and intervention ( $n = 11$ ).

= 4.05,  $p = .13$ ). During intervention, all participants performed part of their transitions with their PDA ( $M = 29\%$  across participants). During post-intervention, there was an increase in percentage transitions performed with the PDA for participants 1 and 2, while their percentage transitions performed with 'no help' further decreased. For participants 3 and 4, however, the percentage transitions performed with the PDA decreased substantially and their transitions were mainly performed with 'no help'. During follow-up, participants 1 and 2 continued performing most of their transitions with their PDA. Participant 3, not having a PDA anymore, performed all of his correct independent transitions using 'no help'.

*Percentage prompted incorrect independent transitions per day for each prompt type*

Table 3 depicts mean percentage prompted incorrect independent transitions per day for each prompt type, for each participant during each condition. As the prompt 'modelling' was not used in any condition, this prompt is not depicted in Table 3.

The overall mean percentage prompted incorrect independent transitions was 57 during baseline and 42 during intervention and post-intervention. Across participants and conditions, most prompted incorrect independent transitions were corrected with 'verbal instruction' as the most intrusive prompt. The overall mean percentages of the use of 'verbal instruction' as the most intrusive prompt were about the same during each condition (i.e., 29, 25, and 28 for baseline, intervention, and post-intervention, respectively). Across participants, the mean percentage incorrect independent transitions corrected with a 'non-specific prompt' (i.e., most intrusive prompt) changed from 24 during baseline to 13 during intervention, and to 10 during post-intervention; the difference between baseline and intervention was statistically significant ( $F(1,3) = 20.01$ ,  $p = .02$ ). During follow-up, incorrect independent transitions by participant 1 were not corrected by staff. Participant 3 was not using his PDA anymore during follow-up and, compared to baseline, his incorrect independent transitions were not corrected anymore by 'verbal instruction', but mainly by using a 'non-specific prompt'. Across conditions and participants, the prompts 'confirmation' and 'physical guidance' were hardly used as the most intrusive prompt in correcting incorrect independent transitions.

*Percentage unprompted incorrect independent transitions per day*

Across participants and conditions, the mean percentage unprompted incorrect independent transitions per day was low, indicating that staff corrected incorrect independent transitions at a high level during all conditions. The mean percentage slightly increased across conditions

**Table 2.** Mean percentage correct independent transitions per day for each device type, device combination, and ‘no help’ for each participant during each condition.

P	Baseline			Intervention			Post-Intervention			Follow-up				
	NH	PDA	VS	NH	PDA	VS	NH	PDA	VS	NH	PDA	VS	CO	
P1	35	0	0	6	42	0	0	0	61	0	0	28	53	0
P2	22	0	7	15	17	2	13	3	24	1	13	0	43	0
P3	56	0	0	51	17	0	0	56	4	0	0	47*	0	0
P4	46	0	0	35	28	0	0	59	2	0	0	-	-	-

NB, P, participant; NH, no help; PDA, personal digital assistant; VS, visual scheme; CO, combination of PDA and VS; -, no data collected.  
 \*Condition during follow-up is the same as during baseline.

**Table 3.** Mean percentage prompted incorrect independent transitions per day for each prompt type, for each participant during each condition.

P	Baseline			Intervention			Post-Intervention			Follow-up			
	CF	NSP	VI	CF	NSP	VI	CF	NSP	VI	CF	NSP	VI	PG
P1	0	43	22	0	29	17	3	0	21	13	0	0	0
P2	7	24	39	1	9	31	0	13	12	29	2	0	15
P3	1	12	27	2	3	9	20	0	6	34	0	13*	33
P4	3	18	29	2	0	4	31	0	3	0	36	0	-

NB, P, participant; CF, confirmation prompt; NSP, non-specific prompt; VI, verbal instruction; PG, physical guidance; -, no data collected.  
 \*Condition during follow-up is the same as during baseline.

from 1% during baseline, to 2% during intervention and post-intervention, and to 8% during follow-up. During follow-up, all incorrect independent transitions for participant 1 ( $M = 18\%$ ) were not corrected by staff and were performed while using her PDA. For participant 3, the mean percentage unprompted incorrect independent transitions during follow-up was 7% and these transitions were performed using 'no help'.

### *Social validity*

Participants rated the PDA as very helpful in fulfilling their daily activity schedule in time ( $M = 4$ , range 3–5) and very easy in its use ( $M = 4.3$ , range 3–5). More variable ratings (range 1–5) were found regarding their reports on changes in frequency of making correct independent transitions in time and on changes in need for assistance from staff, following the introduction of the PDA ( $M = 3.3$ ). Two participants reported they wanted to continue using their PDA, one participant reported some doubt (rating 3) and one participant did not want to use the PDA anymore. Regarding the efficacy of the components of the intervention procedure, the instruction preceding the intervention was rated fairly positive ( $M = 3.8$ ; range 3–5) and the support during transition moments was rated more variable ( $M = 3.3$ ; range 1–5).

According to staff, two participants improved in making correct independent transitions as a result of the intervention. Staff was slightly positive about a decrease in participant's need for staff prompts in transitioning since the use of the PDA ( $M = 2.8$ , range 2–3). Furthermore, staff reported that participants still needed additional prompts in the use of the PDA at transition moments ( $M = 3.2$ ; range 2–4). The effectiveness of the pre-instruction combined with the non-specific intervention procedure was rated slightly positive ( $M = 2.8$ , range 2–3). All elements of staff training were rated positively (range 3–4). The description of the recording categories was often used during recording ( $M = 3.8$ ; range 3–4), indicating it as helpful. Staff varied in using the flowchart during the implementation of the intervention ( $M = 2.8$ ; range 2–4), which may have contributed to some low results on procedural reliability. During the study, the programming of the PDA was rated as the most time-consuming activity and the instruction of participants preceding the start of the intervention was rated as the least time-consuming activity.

## **Discussion**

A brief intervention for teaching the use of a PDA in transitioning in four adolescents with high-functioning ASD resulted in a significant improvement in independent transitioning

between their daily activities at a day treatment facility and medium effect sizes were found for the baseline-intervention changes in three participants and for one participant the effect size was just below the medium effect size interval. Furthermore, the decrease in prompted transitions during intervention was mainly the result of a significant decrease in transitions that were prompted using a ‘non-specific prompt’ as the most intrusive prompt. During follow-up, the PDA was still used by two participants and data on independent transitioning stabilized for one participant (i.e., participant 2) and substantially increased for the other (i.e., participant 1).

Following intervention, participants still needed prompts in 44% (range 32–53) of their daily transition moments and during post-intervention, in which no systematic intervention was in effect, staff prompted participants in using their PDA while using several types of prompts. However, data on participant’s transition behavior and on staff’s prompting behavior during post-intervention indicated no overall changes compared to the intervention phase. At the individual level, however, the percentage of correct independent transitions substantially increased for one participant (i.e., participant 1) during post-intervention as well as during follow-up. This finding seems not to be related to level of IQ, as the full-scale IQ of participant 1 was about the same as that of participants 2 and 3 (range 84–86). Apart from a possible positive effect of prolonged prompting whereby a non-specific prompt was mainly used as the most intrusive prompt (instead of a verbal instruction as was the case in the other participants) and/or her older age (i.e., 20 years old) compared to the other participants, the authors do not have an explanation for the improvement over time in participant 1.

Further analysis of correct independent transitions revealed that, during intervention, concurrent with the onset of independent transitions performed with the PDA, there was an overall (although not significant) decrease in independent transitions performed with ‘no help’. This finding indicates that the significant increase in correct independent transitions during intervention was a result of the correct independent use of the PDA. The decrease in independent transitions performed with ‘no help’ during intervention may also indicate that the PDA took over the control of independent transitions formerly (i.e., baseline) controlled by ‘no help’. This may be inherent in the PDA as the reminder alarm is an automatic prompt and users may learn to wait for this prompt. During post-intervention, however, two participants (i.e., participants 3 and 4) almost stopped using their PDA and performed most of their independent transitions with ‘no help’. There may be several reasons for this change during post-intervention and individual as well as PDA-related factors may have contributed. For example, some participants commented that they already knew the PDA scripts and that

they did not need them anymore and wanted to make the transitions by themselves. Also, it was commented by staff that participants showed ‘irritability’ in using the PDA because of technical problems with online connections which may have improved transitioning using ‘no help’. Next to this, participants may have learned to avoid the PDA (i.e., by using ‘no help’ in transitioning) to escape consequences of not reacting within 10 s (i.e., correction by staff).

Data on staff’s prompt use indicated that they mostly used ‘verbal instruction’ as the most intrusive prompt to correct participant’s transition behavior. A review by MacDuff (1999, cited in MacDuff et al., 2001) revealed that verbal prompting was the most commonly used prompting procedure in persons with developmental disabilities. As most studies on adaptive skill training in youth and young adults with high-functioning ASD were published after 1999 (see e.g. Machalicek et al., 2008; Palmen, Didden, & Lang, 2012), it is not clear if MacDuff’s finding is the present norm for our target group; however, this study confirms MacDuff’s finding. Next to this, it is remarkable that given the overall emphasis on the importance of using visual prompts in skill training in persons with ASD, only one participant in this study used a visual scheme in transitioning (i.e., participant 2). Introduction of the PDA did not result in a substantial decrease in the use of ‘verbal instruction’, whereas a significant decrease in staff’s use of ‘non-specific prompts’ was found. Given the stimulus control of verbal instruction over a large part of participants’ transition behaviors, prompt dependence on verbal instruction may have been developed, which may have complicated the transfer of stimulus control (MacDuff et al., 2001). Staff rated the decrease in participant’s need for staff prompts in transitioning as slightly positive, which may indicate that they experienced some relief in prompting participants’ transitioning behavior following the decrease in use of non-specific prompts during intervention.

Following intervention, participants still needed staff prompts in 32–53% of their daily transitions. This finding is in accordance with participants’ and staff reports on changes in frequency of making independent transitions. Results of the study by Ferguson et al. (2005) also revealed that, following the introduction of a PDA in a 14-year-old boy with Asperger’s syndrome, adult prompts were still needed in managing tasks (i.e., in 13–67% of three different task types). Comparing the results with those of Gentry et al. (2010) is not possible as no data on adult prompts were collected in Gentry et al.’s study. There may be several reasons why the PDA gains insufficient stimulus control on participants’ transitioning behavior. For example, adult prompts implicate attention which may operate as a reinforcer and, therefore, may contribute to prompt dependency (MacDuff et al., 2001). Furthermore, although the use of a PDA may be reinforcing in itself, the consequence for using the PDA

may not be reinforcing in the case of a new activity or task disliked by the participant. In that case, participants may try to avoid or delay the activity by not responding to the PDA. Future research is warranted on the relationship between improvements in independent transitioning between activities using a PDA and individual's activity preference (Kagohara et al, 2011). Additionally, in this intervention no systematic reinforcement contingencies were used which may have reduced effectiveness of the procedure. There were several reasons for not incorporating systematic reinforcement in the procedure. First, as an earlier study on improving use of reinforcement by staff in a natural training setting (see Palmen, Didden & Korzilius, 2010) showed that the effect of behavioral skills training was limited in increasing reinforcement given by staff, it was assumed that intensive staff training might be necessary to limit treatment challenges on the reinforcement component of the intervention. However, as the intervention was conducted by staff in the natural setting next to their regular work duties, it was the aim to keep staff's time on staff training to a limit and to use a brief procedure. Next to this, it was assumed that the use of the PDA might be reinforcing in itself as it enables users to control their own behavior. Furthermore, the PDA-instructions on transitioning always ended with a positive comment which also might have been functioning as a reinforcer. However, given the findings of the present study, it is recommended to examine the additional effects of (self-)reinforcement in future studies on improving independent transitioning using a PDA.

Finally, a longer intervention phase and/or a more intensive prompting procedure than in the present study may be necessary to attain higher gains in independent transitioning. For example, next to a reminder (i.e., the non-specific prompt in our study), Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, and Grider (2009) used additional verbal and gestural prompts to provoke the use of a video iPod as a prompting device in an adolescent with intellectual disability (ID). In the study of Cihak et al. (2010), participants (i.e., four children with autism and ID) were redirected to their video iPod when errors in transitioning (i.e., between settings) occurred after they already had used the video iPod and additional least-to-most prompting was used in case errors continued.

Several shortcomings of the present study should be mentioned. No data on transitioning were collected following the pre-instruction session and the efficacy of pre-instruction could not be determined. Also, follow-up data could only be collected in two participants and no generalization data were collected on transitioning between activities in other settings (e.g., at home or at work). Furthermore, four data points were missing in the data collection of two participants. Visual analysis, however, did not reveal changes in trends

at the onset of missing data points. Next to this, although the overall treatment integrity was good across participants (i.e., > 80%), some treatment challenges occurred for participants 3 and 4 which may have reduced the effectiveness of the intervention. Researchers agree that threats to treatment integrity may especially occur in natural settings (McIntyre, Gresham, DiGennaro, & Reed, 2007; Wilder, Atwell, & Wine, 2006). In the present study, staff had to deliver the intervention in the natural setting next to their regular work duties, which may have complicated maintaining treatment integrity at a high level during the course of the study. Finally, during baseline two participants showed correct independent transition behavior in about 32% of the opportunities per day, while the other two participants showed a percentage of about 50% in a highly variable pattern. The differences in baseline patterns in independent transitioning may have influenced the results. In future studies more stringent inclusion criteria are recommended.

Despite its limitations, the present study provides further evidence regarding the effectiveness of a PDA for improving independent transitioning between activities in youth with high-functioning ASD and for relieving staff in their prompt use. To achieve more clinical improvement, however, future studies should focus on the relative efficacy of different types of interventions on teaching independent transitioning between activities using a PDA in the natural setting and on fading of staff's prompt use. Finally, studies are warranted on the relationship between the efficacy of using a PDA in improving independency and the individual's motivation for using the PDA support for a variety of purposes such as using the PDA for solving a problem, listening to music, and managing daily tasks.

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*Chapter 7*

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## **Chapter 8**

### **General conclusions and discussion**



## **General conclusions and discussion**

The present thesis focused on the use of behavioral interventions in improving the functional use of adaptive skills in adolescents and young adults with high-functioning ASD (HFASD). In the first section of this chapter, the contributions of our studies to the current state of behavioral intervention research on adaptive skill building in our target group are summarized. In the next session, the results of our studies will be discussed in perspective of improving, generalizing, and/or maintaining adaptive skills in regular, daily life settings. Furthermore, the implications of self-management and technical supports are reviewed regarding the independent use of adaptive skills. Finally, the role of staff performance in implementing behavioral interventions in our target group will be discussed.

### **Contribution to the current state of behavioral intervention research**

Our review revealed that the number of studies on teaching adaptive skills in (young) adults with HFASD has increased during the last years. However, as only 8 of the 20 selected studies included a participant in the age of 20 years or older, it appears that this age-group is still overlooked by intervention researchers. This finding may, in part, reflect the fact that many people in the older age-range do not attend schools or clinics where their behavioral needs are readily apparent to researchers (Edwards, Watkins, Lotfizadeh, & Poling, 2012). In the four intervention studies in this thesis at least one person with HFASD in the age of 20 years or older participated. We found that it was difficult to recruit participants by way of websites and newsletters. In accessing individuals for participation in our studies, individual's attendance of service settings and researcher's contacts with individual's relatives (e.g., parents, personal coaches) facilitated recruitment.

Regarding the types of adaptive skills that had been targeted on in the studies of our review, we found that most attention has been given to teaching social interaction skills. This finding might be expected as social impairments are part of the ASD symptomatology. However, outcome studies in adulthood revealed that there are also other important living skill areas in which our target group experiences problems that contribute to poorer outcomes (e.g., Farley et al., 2009). Therefore, more behavioral intervention research is needed on adaptive skill domains such as work, community participation, leisure, and domestic living. In this thesis, one of the intervention studies focused on improving the use of a functional social skill (i.e., question asking). The other three intervention studies focused on improving leisure



skills, a work related skill (i.e., task engagement), and a daily living skill (i.e., transitioning), respectively.

In contrast to the social skills studies which mostly made use of a group format, the studies on the other adaptive skill domains in our review all used one-to-one formats. Given the urge to develop time- and cost efficient intervention procedures, it is recommended to study the effectiveness of (small) group formats in future interventions on such types of adaptive skills. In this thesis, for example, we found that a small group intervention was effective in improving task engagement (see Chapter 6). It seems that teaching in small group formats may also be effective in improving non-social skills in persons with HFASD.

Results of the review further revealed that the use of self-management strategies and/or technical supports (e.g., written scripts, prompts on iPods) yield positive results in improving adaptive skills. It is suggested that such strategies and supports foster the generalization and maintenance of the skills in regular (daily life) settings. However, we found that generalization and maintenance of adaptive skills have received little attention in previous research on our target group. Data collection on generalization mostly took place within the location of the training and only a few studies collected data on maintenance, of which most data were collected at short-term follow-up. In the studies of the present thesis the effectiveness of behavioral interventions, containing self-management strategies and technical supports, is examined on the generalization, and/or maintenance of adaptive skills in regular settings.

In the review, we concluded that the certainty of evidence of 40% of the studies was low (i.e., suggestive). This was mostly the result of the use of weak designs, for example all studies with a group design lacked a control group or failed to randomize. In intervention studies on (HF)ASD, randomization and matching of groups may be complicated given the individual characteristics of the disorder (Matson & Smith, 2008; Mesibov & Shea, 2011). Within ABA, most researchers utilize some variant of single-case designs (Granpeesheh, Tarbox, & Dixon, 2009; Roane, Rihgdahl, Kelley, & Glover, 2011). These kinds of designs allow researchers to systematically test an intervention using a small number of participants and to examine the effects of the intervention on each individual using repeated measures to control for normal variation in participant's behavior (Matson, Turygin, Beighley, & Matson, 2012; Roane et al., 2011). However, a consequence of such designs can be that the number of participants in the studies is relatively small. In improving the generalizability of the conclusions of such studies, replications are needed.

In our review, we found that only 7 of the 20 studies included six or more adults with HFASD. The small number of participants may indeed be inherent in the designs used (i.e., mostly single-case designs), but also in the complexity and/or labor-intensity of the behavioral interventions that were implemented (e.g., individual trials versus role-plays of participants), and/or the measures used for data collection (e.g., repeated measures by observation versus pre-post measures using questionnaires). In our intervention studies, we aimed at including six or more participants per study and we used multiple baseline designs across (small groups of) participants and one group design. However, practical problems have reduced the number of participants in one study (i.e., early drop outs in Chapter 7) and the internal validity of another study (i.e., matching and randomizing was hindered in Chapter 5).

Finally, in improving the methodological rigor of future behavioral intervention studies, we recommend to control for variations in implementation. To limit variations in implementation of the procedures in our studies, several measures were used. For example, treatment providers used flowcharts of the intervention procedures, they were supervised by researchers, and/or data on treatment integrity were collected.

### **Effectiveness of interventions**

The behavioral interventions were aimed at improving, generalizing, and/or maintaining adaptive skills in regular, daily life settings. To foster the generalization of skills across settings and/or time we used several program components (see e.g., Arnold-Saritepe, Phillips, Mudford, De Rozario, & Taylor, 2011; Cowan & Allen, 2007). For example, the intervention programs that were conducted in simulated settings (Chapters 3 and 6) were programmed for generalization by using common stimuli, multiple stimulus- and response exemplars, and self-management strategies (i.e., self-monitoring, instruction, evaluation, and reinforcement) containing visual supports on the response strategy. The intervention program that aimed at improving daily transitioning was conducted in a regular (day treatment) setting (Chapter 7). To improve the functional use and maintenance of the skills, the intervention was implemented by staff in the presence of regular material and social circumstances (e.g., radio, peers), regular stimuli (i.e., transitioning tasks) were used for training, and a self-prompting tool (i.e., a PDA) was used as well. Finally, to improve the generalization of an outpatient program (Chapter 5), the program was implemented in multiple settings and multiple exemplars and self-management strategies were used. Compared to the intervention programs implemented in the simulated and regular settings, also a less rigidly structured program

format (e.g., trainers should use naturally occurring teaching opportunities) was used to foster the generalization of the skills to participant's regular living environment.

Findings of our studies revealed that the interventions were effective in improving the functional use of the skills in the regular settings. However, the findings of our study on leisure skills should be interpreted with some caution given its quasi-experimental design. Data on maintenance, collected in three studies, revealed that results maintained at short-term follow-up. In our study on task engagement (Chapter 6), we also collected data at long-term follow-up (i.e., 6 months). Findings for the three students that participated at long-term follow-up revealed that although there was a small decrease, the levels of task engagement remained above baseline levels. These findings are in accordance with the results of our review, indicating that for promoting long-term maintenance of skills in young adults with HFASD additional strategies may be necessary. For example, how long newly learned skills maintain in the behavioral repertoire depends on how functional they are to the student (Arnold-Saritepe et al., 2011). Therefore, it is necessary to ensure that the student has enough opportunities to use and practice the skills in the regular setting and that there are natural contingencies (automatically or in the environment) that continue to reinforce the use of the skills (Arnold-Saritepe et al., 2011; Duker, Didden, & Sigafos, 2004).

Except for our study on transitioning (Chapter 7), generalization across settings was measured in a regular context of the participants in which the intervention was not implemented and trainer was absent (e.g., regular tutorial conversation, regular job-training). The regular context included a regular location and less structured circumstances as during intervention, other persons (e.g., peers, staff, and/or parents) and other stimulus exemplars (e.g., work tasks) were present as well. Therefore, generalization seems to have occurred not only to another location than the training location, but also across persons, subjects, and responses. However, we did not measure generalization across more than one location and this should be a topic of future studies.

In all our intervention studies, several components may have contributed to the generalization of the target skills across settings and time. Next to the programming of the interventions for generalization by using common stimuli, multiple exemplars, and self-managements strategies containing visual or digital supports, also the particular type of targeted skills may have fostered generalization. All skills addressed in the present thesis may be considered as pivotal skills, that is, skills that are central to wide areas of functioning. For example, 'question asking' is a common mean of both initiating interactions and of acquiring information. Next to this, all skills entailed self-management and it has been asserted that self-

management is also a pivotal skill. Such pivotal skill areas are suggested to produce skill improvements across conditions, responses, and time (Koegel, Koegel, & McNERney, 2001; Koegel, Koegel, & Parks, 1995). Given the diversity in components that may have fostered generalization, we do not know if and how much each component has contributed to the treatment effectiveness.

In the studies in which we used multiple baseline designs across (small groups of) participants, we found some variability in the effectiveness of the intervention procedures across the participants. This finding indicates that individual variables, such as age (see Chapter 7), skill profile during baseline (see Chapters 2 and 7), and/or the motivation of participants for performing the target skill (Arnold-Saritepe et al., 2011), may have contributed to the variability in outcome. For example, in our study on transitioning (Chapter 7) we suggested that the students may have differed in their motivation on participating in the diverse activities that they should transition between. Although the tool that was used (a PDA) may be useful for transitioning, the tool on itself will not improve the motivation of the students to participate in a particular activity. To control for the influence of such individual variables, more stringent inclusion criteria should be used regarding the (variability in) skill level, individual's motivation for participation, and the age of the participants. For example, in future studies smaller age ranges (e.g., 14–17 years old compared to 18–23 years old) may be used in selecting participants. In our study on task engagement (Chapter 6), we used a maximum criterion regarding the occurrence of the target skill. In this study, participants were first selected by staff. For the final selection, data on the target skill were collected by observations. Potential participants (according to staff) of whom the data on the target skill exceeded the maximum criterion were not selected for participation. In general, the determination of a selection criterion regarding skill performance can be complicated given the variable skill patterns that may exist in our target group and the lack of normative data on the frequency of adaptive skills. Low skill levels as well as relatively high but variable skill levels indicate an urge for intervention. As different intervention packages may be needed for each of these target groups, selection criteria regarding skill performance should differentiate between low skill levels and relatively high but variable skill levels.

In selecting persons for participation in interventions on adaptive skill building, motivational issues seem to be in need for research in our target group. For example, the participants in all of our studies wanted to take part in the studies and informed consent was obtained. However, only in our study on leisure skills additional data were collected on person's motivation to change his/her leisure behavior as it was a selection criterion for

participation. In that study we found that some persons who wanted to take part in the study indicated that they had a low motivation for changing their leisure behaviors. Moreover, in our study on task engagement (Chapter 6), we found that some persons that fulfilled the selection criteria did not want to take part in the study, although their behavior indicated an urge for intervention. We do not have information about the reasons for not wanting to participate in the study. Further research in our target group on reasons for participating (or not) in interventions on adaptive skill building may yield information about ways to improve individual's motivation for participation.

We found that the behavioral interventions improved the functional use of adaptive skills in adolescents and young adults with HFASD. We did not collect data on the cognitive styles of the participants. Given the differences in cognitive styles of persons with HFASD (e.g., Teunisse, Cools, Spaendonk, Aerts, & Berger, 2001), future research should deal with possible interactions between cognitive styles and the effectiveness of particular behavioral intervention strategies in improving the use of adaptive skills in regular settings. For example, it may be that self-management strategies combined with technical supports are particularly effective for persons with impairments in executive functions as these impairments indicate problems in regulating behavior. It may also be that interventions in multiple settings are particularly effective for persons with weak central coherence given their detail-focused processing style. Research on this topic may contribute to the determination of possible predictive cognitive variables in the effectiveness of behavioral procedures in students with HFASD.

### **Variability across interventions**

The results of the studies conducted in the simulated settings were most impressive in the extent to which skills were generalized to the regular, daily life setting and maintained over time. In addition to this, the procedures we used in the simulated settings could be viewed as time- and cost efficient as they were implemented in small group-formats and consisted of four to six 1-hour sessions conducted in a period of 6 weeks. Simulation training may have several advantages over training in regular settings, such as reduced costs, more learning opportunities for practicing the targeted skill, and less threats to treatment integrity (e.g., McIntyre, Gresham, DiGennaro, & Reed, 2007; Sheridan & Raffield, 2008). When comparing the interventions in the simulated-, regular-, and multiple settings, several differences do appear that may have influenced the variability in outcomes across interventions. These differences concern the use of (a) error correction and reinforcement procedures, (b) the

structure of the training formats, and (c) the complexity of the targeted skills and diversity of the cues that should evoke the skills in the regular settings. These issues are discussed below.

The training programs conducted in the simulated settings (Chapter 3 and 6) consisted of highly structured training formats using systematic reinforcement and intense (i.e., repeated) error correction procedures. In these studies, correction of an incorrect response was continued (while using more intense prompts) until a correct response was made by the student. In the study on transitioning in the regular setting (Chapter 7), however, no systematic reinforcement was used and if an incorrect response was made, the incorrect response was corrected only once. The use of more intense error correction procedures in adaptive skills training was also one of the recommendations following our review (see Chapter 2). This may be explained by the fact that such correction procedures yield more learning opportunities to practice the correct response than procedures containing descriptive feedback or a single response correction.

The variability in effectiveness across the interventions may also be explained by differences in the conditions in which the interventions were implemented. For example, the intervention in the regular setting (Chapter 7) had to be delivered by staff next to their regular work duties such as supervising other clients. Such ‘natural’ conditions may lead to challenges in the consistent implementation of the procedure (McIntyre et al., 2007). Despite good overall treatment integrity scores across participants, some treatment challenges have occurred that may have reduced the effectiveness of the intervention. Treatment challenges may also have occurred in our study on the effectiveness of an outpatient program in improving leisure skills (Chapter 5). Although we did not systematically collect data on treatment fidelity in this study, trainers (i.e., staff members of the treatment facility where the therapy setting was located) and supervisor reported difficulties in implementing error correction and in managing group interactions such as topic management. In comparison with the intervention procedures of our other studies, the content of the leisure group program was structured less tightly regarding the stimuli to use for training and the opportunities for training trials per participant. Trainers should also use naturally occurring opportunities to evoke and prompt skill performance by participants. Such less rigid intervention formats involve trainer performance that is flexible and variable as training does not consist of a relatively simple and rather invariant chain of trainer responses (Cowan & Allen, 2007; LeBlanc, Gravina, & Carr, 2011; Sturmey, 2008). Problems in the implementation of this complex procedure may have limited participants’ learning opportunities for the leisure skills. To improve the accurate implementation of these less structured types of intervention

programs, it is recommended to screen trainers for creating, noticing and using natural teaching opportunities (LeBlanc et al., 2011). Such screening may indicate an urge for additional training in improving the teaching skills of trainers (see also the section on *Role of staff performance in training adaptive behavioral skills*).

Another factor that may explain the variability in effectiveness across the behavioral interventions concerns the type of the targeted skills that were taught. For example, the target skills of the leisure program included more skill components (e.g., choosing, arranging, and initiating a variety of leisure activities) than the target skills of the other intervention studies (i.e., question asking, task engagement, transitioning between activities). To focus on all the skill components, the leisure program had a broad content which, however, may have been too broad to result in improvements in all of the leisure targets. Future studies might be designed to examine whether the successive introduction of different leisure targets for intervention affects outcomes, for example by using a multiple baseline design across skill components.

Finally, the situations that should evoke and control the use of the targeted skills in the regular settings (i.e., natural cues) where more diverse for the leisure skills than for the targeted skills in the other intervention studies. For example, the natural cue for using the self-management strategy for ‘choosing’ leisure activities (e.g., “I do have leisure time, but I do not know what to do”) is different from the natural cue for using the self-management strategy for ‘arranging leisure activities’ (e.g., “Next Saturday, I want to go to the movies with somebody, what should I do to arrange this?”). In the other intervention studies, however, the situations that should evoke the targeted skills consisted of much the same characteristics. The diversity of the natural cues that should evoke the use of the leisure skills may urge for generalization training under more naturalistic conditions (e.g., living setting), next to the generalization components used in the program (Cowan & Allen, 2007). In this respect, future research should address the additional generalization effects of involving the regular support system of the participant (e.g., family members, personal coaches) in outpatient intervention programs for adolescents/young adults with HFASD. For example, relatives might be instructed about how to help the student in making homework assignments and might be taught to use naturally occurring opportunities in stimulating individuals to use self-management strategies and in providing reinforcing contingencies.

At present, research on parent training is growing in the field of behavioral intervention studies on children with ASD (see e.g., Patterson, Smith, & Miranda, 2012). However, involving natural care providers in interventions studies on adolescents and young

adults who are living with family members or (semi-) independently has received little attention by researchers. The few studies on this field attended on involving parents in the treatment. These studies, however, provide insufficient detail on the parent training procedures (Ferguson, Smith Myles, & Hagiwara, 2005; Gentry Wallace, Kvarfordt, & Lynch, 2010) and/or do not present data on parents' or students' behavioral performance (Laugeson, Frankel, Mogil, & Dillon, 2009). There is a need for studies that systematically examine the effectiveness of relatives-assisted outpatient programs on the generalization of students' skills to natural settings.

### **Role of self-management and technical supports**

It has been suggested that the use of self-management strategies, applied alone or in combination with low- (e.g., written schedules) and/or high- (e.g., iPod, computer) technical supports, promote independent behavior in persons with ASD. The use of such strategies and/or supports may lead to a decrease in adult-delivered prompts as the strategy and/or the technical supports deliver the prompt(s) that are needed to perform the skills. The portability of the technical supports is considered relevant in increasing independency in skill performance as it has been found that if visual cues are displayed on a wall (e.g., activity schedule) or on a computer (e.g., video-modelling) students still need adult prompts to initiate the use of the technical supports (e.g., Cihak, 2011). At present, a minority of the studies on the effectiveness of self-management strategies and/or portable supports in our target group collected data on skill performance in regular settings. Next to this, data on the independent completing and also initiating of the skills are collected even more sparsely. Results of the few studies indicate that the interventions do result in increases in the fully independent use of the targeted skills in regular settings; but, in part, adult prompts are still needed (Ferguson et al., 2005; Smith Myles, Ferguson, & Hagiwara, 2007). In three of our intervention studies, self-management strategies were combined with portable visual cues (i.e., flowcharts) and data were collected in regular settings. Despite the improvements in the skills, we found that adult prompts were still needed in part of the skills. However, data on the adult-delivered prompts were collected only partially and/or indirectly by using questionnaires, which has complicated the interpretation of these data.

To provide more accurate data on the effects of self-management strategies and/or supports on independency, we directly measured the prompts that staff used in initiating and completing the target response in our study on transitioning (Chapter 7). We found that less transitions were prompted by staff following the intervention on using a PDA. However, staff



prompts were still needed in some part of students' daily transitions. We also collected data on the types of prompts that staff delivered. When the types of staff prompts are considered, a substantial decrease in adult prompted transitions was only found for transitions that formerly (i.e., during baseline) were prompted by delivering non-specific prompts (e.g., "Do you still have leisure time?"). No changes were found for transitions that formerly were prompted by staff using verbal instructions (e.g., "It is time to leave for job-training."). The results of our study suggest that if the performance of adaptive skills is controlled by verbal instructions of staff, it may be more difficult to transfer the control to a self-management strategy/technical support than when skills are controlled by non-specific staff prompts. Our finding that the largest increase in independent transitioning was made by the participant of whom the transitioning behavior during baseline was mainly controlled by non-specific staff prompts (i.e., the other participants mostly needed verbal instructions) is in concordance with this suggestion.

Persons with ASD are susceptible to prompt dependency as they may have difficulties in focusing on the relevant natural cues in the environment that should evoke the behavior (see e.g., MacDuff, Krantz, & McClannahan, 2001; Minshawi, Ashby, & Swiezy, 2011). Characteristics of the controlling prompts may affect prompt dependency. In persons with ASD it has been suggested that the use of verbal instructions may complicate the transfer of stimulus control and may inhibit independence (MacDuff et al., 2001; Minshawi et al., 2011). Our findings in the study on transitioning support this. Verbal prompts seem to be commonly used in supporting persons with ASD (MacDuff et al., 2001; Minshawi et al., 2011) and perhaps even more in the target group of individuals with HFASD given their large spoken vocabularies and intact formal language. In the case that skill performance is mainly dependent on the delivery of verbal instructions by adults, more intense behavioral intervention procedures may be needed regarding the type of error correction, the number of learning opportunities, and/or the number of sessions. Therefore, future studies on improving independent performance of functional skills in our target group should deal with the particular adult prompts that are delivered in evoking the functional skills in regular settings. Next to this, when studies target on transferring the stimulus control of an adaptive skill from prompts delivered by adults to self-management strategies or technical supports, adult delivered prompts should be removed in evoking the adaptive skill in regular settings. Such an intervention has to focus on training the accurate use of the strategy/technical support as a self-prompting tool and in case of incorrect responding, students should be directed back to the strategy or support.

### **Role of staff performance in training adaptive skills**

In chapters 3, 5, 6, and 7 we evaluated the effectiveness of behavioral interventions in improving the functional use of adaptive skills in our target group. In chapter 4, however, we focused on the use of ABA-based skills by staff while they conducted their regular training in job-related skills of adolescents with HFASD. For successful training of adaptive skills, there have to be sufficient teaching opportunities and these opportunities should be used correctly by treatment providers (e.g., trainers, staff). We found that during baseline, staff's levels were low regarding the correct use of opportunities for error correction and reinforcement and also regarding the initiating of teaching opportunities. Next to this, in the case a teaching opportunity was initiated by staff, this only in a minority of the opportunities was followed by a target response of students (correct or incorrect question for help). Staff training was indicated to improve the teaching behaviors of staff.

Behavioral skills training (BST) containing multiple components such as modelling, rehearsal, role-play and (on-the-job) feedback is most effective in teaching staff the implementation of ABA-skills when training persons with ASD (Sturmey, 2008). Most studies are conducted in structured, one-to-one training formats for children with ASD. However, training of (small) groups of students in natural training conditions may contain less structured teaching formats than training in simulated and/or one-to-one training conditions (Cowan & Allen, 2007; Sturmey, 2008). In such natural conditions, intervention providers have to 'follow' the behavior of several students, they have to create opportunities for teaching the targeted skills, and they also have to use naturally occurring opportunities (initiated by students) for teaching. Implementation of such type of training is complicated given the flexibility and variability needed in the teaching behaviors of staff. To improve the integrity and effectiveness of teaching in such low structured conditions, staff should receive specialized training in creating, identifying, and correctly using opportunities for teaching. This topic has been given some attention in studies conducted on teaching children with ASD, for example in group settings at school (Ryan, Hemmes, Sturmey, Jacobs, & Grommet, 2008; Schepis, Reid, Ownbey, & Parsons, 2001) or in one-to-one play conditions (e.g., Huskens, Reijers, & Didden, 2012). Our study seems to be the first that focused on staff performance in the treatment practice of training adolescents with HFASD in groups.

Our study on staff training aimed at improving the correct use of opportunities for 'positive reinforcement' and 'error correction' and the 'initiating of teaching opportunities'. As the ultimate goal of staff training is to improve students' target skills, we also collected

data on students' job-related target skills regarding 'asking for help' (a target skill of students on which staff training particularly focused) and 'working on a task' (a target skill of students to measure generalization of the staff skills). To promote generalization of staff skills across students' target behaviors, multiple exemplars of these target behaviors were used during behavioral practice (i.e., role-play) of the staff skills (see e.g., Gianoumis & Sturmey, 2012).

We found that BST was most effective in improving the correct use of opportunities for error correction and of teaching opportunities initiated by staff. Results were less impressive regarding staff's use of reinforcement and staff's initiating of teaching opportunities. It was remarkable that staff's use of reinforcement particularly improved during the condition in which the intervention was conducted on improving 'initiating teaching opportunities'. During that condition, staff's initiations mostly resulted in target responses of students. This may indicate that staff is more apt to reinforce correct target responses of students that are initiated by staff than to reinforce correct target responses that are initiated by the students themselves. However, such a propensity may contribute to dependency on adult-delivered prompts and limit the development of the independent use of functional skills although this is the ultimate goal of teaching. Findings on students' behavior suggest that improvements in staff performance resulted in increases in the number of questions asked by students. Data on the generalization of staff skills across target behaviors of students indicate that there was an increase (though not statistically significant) in the use of reinforcement for 'working on a task'.

The BST package showed promising results on improving staff performance in regular training settings. In improving the overall level of correct teaching by staff in regular settings, several topics for further research are suggested. For example, on-the-job feedback may be made more intense by improving the number of sessions per week and/or the total number of sessions. Next to this, performance criteria may be used for discontinuing practice and starting on-the-job feedback as well as for fading of on-the-job feedback (Arco, 2008; Schepis et al., 2001). Also, the type and/or content of the feedback may be changed. It has for example been suggested that the combination of process (i.e., staff's behavior) feedback with outcome (student's behavior) feedback may have beneficial effects compared to feedback with only process information, if the purpose of staff training is to produce specific student outcomes. In such cases outcome feedback can have reinforcing properties in training staff (Arco, 2008). Furthermore, to generalize the use of staff skills from the therapeutic (staff training) setting to the regular setting in which staff conduct their training, stimuli may be used that mediate generalization such as self-recording and self-evaluation by staff (Gianoumis & Sturmey,

2012). To improve generalization of staff skills, Gianoumis and Sturmey (2012) emphasize that role-play scenarios should represent a sample of the stimuli that may be encountered in the regular setting (i.e., common stimuli). Although we used multiple exemplars of students' target behaviors during the behavioral practice of the staff skills, the conditions of regular training may have been represented insufficiently in the role-play scenarios. For example, we did not use role-play scenarios in which one staff role and more student roles were included, while this is one of the conditions that may be encountered during regular training. In composing role-play scenarios for behavioral practice, it is recommended to conduct a more systematic selection of the natural training conditions of staff.

In general, we found that reinforcement was only sparsely used by staff. That was also one of the findings in our study on task engagement (Chapter 6). For improving and maintaining the use of adaptive skills it is necessary to manipulate reinforcing contingencies (Arnold-Saritepe et al., 2011; Duker et al., 2004). This means that reinforcement schedules should be gradually thinned from intense (in the stage of improving the use of the skill) to more intermittent and natural (e.g., delayed praise) schedules of reinforcement (in the stage of maintenance of the skill). Limited use of reinforcement in the stage of improving the use of a skill (as was the case in our study) may reduce effectiveness of training. Findings of our study suggest that staff is more apt to apply error correction than to apply reinforcement in teaching adolescents and/or young adults with HFASD. It is not clear why this was the case as there were relatively more opportunities for reinforcement than for error correction. It was suggested that staff's beliefs about reinforcing might have influenced their teaching behavior. At present, there are very few studies that focus on variables that contribute to the behavior of treatment providers in training individuals with ASD. The preliminary studies in this field have targeted on behavioral interventions implemented by therapists and/or parents in training children with ASD (Solish & Perry, 2008; Symes, Remington, Brown, & Hastings, 2006). It was found that variables such as characteristics of targeted skills, child characteristics, and/or beliefs of therapists/parents about intervention components may influence the behavior of treatment providers. Given the urge for interventions in our target group, the large number of mediators that may be involved in implementing interventions, and the relevance of treatment accuracy in the effectiveness of interventions, future studies should address the identification of variables contributing to the teaching behavior of treatment providers in training adolescents/young adults with HFASD. This information may contribute to the effectiveness of training treatment providers and may improve the outcomes of adaptive skill training in our target group.

### **Concluding remarks**

Research on the effectiveness of behavioral interventions in adaptive skill building in adolescents and young adults with HFASD has increased during the last years. Our review noted trends and limitations in studies on behavioral interventions in adaptive skill building. Our intervention studies focused on the improvement, generalization and/or maintenance of functional skills in regular settings, a topic relevant in fostering community-living in adulthood. We targeted on a very small range of functional skills and a small, but relevant issue in enabling adults to function as independently as possible in everyday life. Our findings show that behavioral interventions, containing self-management combined with handheld visual or digital supports, are promising strategies for improving, generalizing and maintaining functional skills in adolescents and young adults with HFASD. We have highlighted several pitfalls that may occur in designing behavioral interventions for generalizing and maintaining behavior, in implementing behavioral intervention programs, and in targeting on independent performance in adolescents and young adults with HFASD, and several suggestions have been made to deal with these pitfalls.

Adolescents and young adults with HFASD need to prepare for their transition to adulthood. Given their impairments in adaptive functioning, interventions in improving the use of practical every day skills should be part of that preparation. Unfortunately, until recently, intervention studies on adaptive skill building in persons with (HF)ASD have hardly included participants beyond the age of early adolescence. Our studies on the role of ABA-based interventions in adaptive skill building in adolescents and young adults with HFASD have shown not only the effectiveness of intervention strategies, but also the feasibility of such strategies in clinical practice.

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## **Summary**

## *Summary*

## Summary

The levels of adaptive skills of adolescents and young adults with high-functioning autism spectrum disorder (HFASD) show substantial limitations and a discrepancy has been found between overall cognitive ability and adaptive functioning, favouring IQ over real-life skills. As the level of adaptive functioning of persons with HFASD is positively related to better outcomes in adult life, improving adaptive skills can be considered an important issue in preparing adolescents and young adults with HFASD for their transition to adulthood. Intervention studies on adaptive skill building in persons with HFASD have hardly included persons beyond the age of early adolescence. As Applied Behavior Analysis (ABA) is considered best practices for teaching adaptive skills to young people with (HF)ASD, research is warranted on the effectiveness of ABA-based interventions in adolescents and young adults with HFASD. In present thesis results are presented of six studies on behavior interventions in adaptive skill building in adolescents and young adults with HFASD. The thesis starts out with a systematic review of behavioral intervention research on adaptive skill building in young adults with HFASD. In addition, a report on five empirical intervention studies is provided. One of the studies focused on the use of ABA-based teaching skills by staff. Interventions are programmed for generalization by making use of self-management techniques, visual or digital supports, multiple exemplars, and/or common stimuli. Results are presented on the functional use of adaptive skills in natural settings, the initiation of skills, and/or maintenance of skills over time.

In *Chapter 2*, results of the systematic review are presented. Search procedures were limited to articles written in English and published between January 1990 and August 2011 in peer-reviewed journals. Twenty studies were identified meeting pre-determined inclusion criteria. Six studies were published as of January 2010, suggesting that this topic is being given more attention. Most studies ( $n = 8$ ) targeted on improving social interaction skills. The other studies targeted on academic skills ( $n = 6$ ), vocational skills ( $n = 5$ ), and domestic skills ( $n = 1$ ). It was remarkable that not one study focused on improving leisure skills despite the problems in this area in our target group. Nineteen studies reported improvements in (part of) the targeted adaptive skills, following intervention. Given the use of pre- or quasi-experimental designs and/or lack of methodological transparency, eight studies could only provide a 'suggestive' level of certainty of evidence. Intervention procedures mostly consisted of treatment packages. Technology assisted procedures (e.g., video modelling, self-management combined with visual cues) were found to be promising in adaptive skill

## Summary

building, as well as interventions involving reinforcement contingencies and/or corrective feedback using prompts. Data collection in natural settings was limited. In future studies it is recommended to use true experimental designs, to include more participants ( $N > 5$ ) and also more participants in the age of 20 years or older, and to focus on generalization and maintenance of skills in regular settings.

In *Chapter 3*, results are described from a study on improving question asking in nine young adults with HFASD during their tutorial conversations with their personal coach. Six intervention sessions were implemented in a group format ( $n = 3$ ) in a simulated setting. Behavioral data were collected in the regular setting of participant's tutorial conversations (i.e., generalization). The behavioral intervention package consisted of discrimination training, behavioral practice using role-play with the experimenter, teaching self-management, use of multiple exemplars and common stimuli, response correction using least-to-most prompting, and reinforcement. The intervention package was effective in generalizing question asking to the regular setting and results were maintained at 1-month follow-up. Results could not be attributed to silence prompts by staff or increased attention.

*Chapter 4* focused on the performance of staff during their regular job-training of adolescents with HFASD. A behavioral skills training (BST) package was conducted to improve staff performance on providing correct reinforcement and error correction, and on initiating teaching opportunities for students to show a target response of job training (i.e., asking for help). Changes in students' target response were also evaluated as well as generalization of staff performance to another target response of students (i.e., working on a task). Per staff skill, BST consisted of one group instruction (containing discrimination training, behavioral practice, multiple exemplars, and feedback) and six individual feedback sessions. Feedback sessions were conducted immediately following regular job training sessions. Improvements in staff skills were found following intervention and the increase in the use of error correction was statistically significant; improvements were maintained at short-term follow-up. The improvement in the use of reinforcement during post-intervention may have been the result of a generalization effect of the intervention on initiating teaching opportunities. Data also showed an increase in the use of questions for help by students. Results on generalization of staff skills across target responses of students, however, were limited. With respect to future research, it is recommended to improve the number of feedback sessions and to combine process feedback with outcome feedback. Furthermore, to improve generalization of staff skills, it is recommended to use additional techniques such as

self-recording and to conduct a more systematic selection of natural training conditions of staff (common stimuli) in composing role play scenarios for behavioral practice.

The study conducted in *Chapter 5* consisted of an outpatient group training program on leisure skills for adolescents and young adults with HFASD, living with family members or (semi-) independently. A total number of 12 students participated. Instead of a multiple baseline design, which we used in the other studies, a pre-test-post-test control group design was used. To promote generalization of skills to the real life setting of the participant, we used common stimuli, multiple exemplars, self-management strategies, home work assignments, and fading of intervention sessions. Data were collected on leisure behavior of participants in daily life (i.e., generalization), by using self-reports and proxy reports (relatives). Dependent variables were (a) need for support in managing leisure, (b) leisure engagement, and (c) leisure satisfaction. Within-group statistics for the experimental group ( $n = 7$ ) revealed statistically significant pre-post changes on self-reports in 'need for support' (decrease) and 'leisure satisfaction' (increase), following intervention. In the control group, no significant pre-post changes were found on these variables. Between-group differences indicated large-to-medium effect sizes for the changes in 'leisure support' and 'leisure satisfaction', in favour of the experimental group. Results on 'leisure engagement' revealed less convincing changes following intervention. Pre-post differences on proxy reports ( $n = 5$ ) revealed no statistically significant changes. Participants tended to rate their changes in need for leisure support more positively than their relatives. In future research, it is recommended to use behavioral measures (e.g., self-recording) instead of questionnaires as they can provide a more accurate profile of leisure behavior. To promote generalization, it is recommended to involve the regular support system of the participant in outpatient intervention programs for adolescents/young adults with HFASD.

*Chapter 6* reports on the results of a second study in a simulated setting. The first study (see Chapter 3) targeted on question asking. This study aimed at improving task engagement in six young adults with HFASD, in a regular job-training setting (i.e., generalization). The intervention package consisted of the same components as the package used in the study of Chapter 3. However, the behavioral practice part was expanded with a duration component given the characteristics of the target behavior. Next to this, unknown task exemplars were used to improve generalization. The package was effective in improving task engagement in the regular setting while performing regular job tasks (i.e., generalization). The improvement in task engagement could not be attributed to changes in staff's behavior. As in the study of Chapter 3, results were maintained at short-term follow-up

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(i.e., 6 weeks). Supplementary to the study of Chapter 3, data were also collected at long-term follow-up (i.e., 6 months). Findings revealed light increases in off-task behavior; however, outcomes stayed below baseline levels.

The intervention described in *Chapter 7* was conducted in a regular setting (i.e., living room of day treatment setting) and focused on improving independent transitioning between daily activities. Intervention was implemented by regular staff and four adolescents with HFASD participated. During intervention, a personal digital assistant (PDA) was introduced as a self-prompting tool in transitioning; the PDA was programmed with an auditory alarm and individual instructions. The brief intervention consisted of (a) one technical instruction session on the use of the PDA and (b) the delivery of one non-specific prompt to evoke the use of the PDA in case of an incorrect transition while not using the PDA. Data were collected on the initiation and correct application of transitions between daily activities; data were also collected on prompt use by staff in evoking correct transitions. The intervention resulted in a statistically significant improvement in independent (i.e., without staff prompts) transitioning between daily activities and a decrease in prompted transitions by staff. Results were more or less maintained during post-intervention for all participants. During short-term follow-up (4-6 weeks), effects were maintained for the two participants that still used their PDA. The natural context used for training as well as the PDA can be considered common stimuli and may have fostered the application and maintenance of the independent transitioning skills in the regular setting. Regarding the prompt use of staff, it was found that the decrease in prompted transitions during intervention was mainly the result of a statistically significant decrease in transitions that were prompted using a non-specific prompt. Between baseline and intervention, no changes were found in the (relatively high) number of transitions that were prompted by verbal instructions. This finding suggests that the teaching of self-management (in combination with a PDA) may be complicated by characteristics of the prompt that controls the target behavior (i.e., prompt dependency). To achieve more clinical improvement, in future studies it is recommended to focus on fading the use of verbal instructions by staff.

In the final chapter, *Chapter 8*, the methods and results of the studies in this thesis are discussed. Results of the studies show the effectiveness of ABA-based procedures, containing self-management strategies combined with technical supports, in improving, generalizing, and maintaining adaptive skills in adolescents and young adults with HFASD. Results are discussed in relation to characteristics of (a) intervention procedures (e.g., type of error correction procedure), (b) intervention setting (e.g., simulated versus natural settings), (c)

target behaviors (e.g., complexity of skills, characteristics of controlling prompt), (d) participants (e.g., skill profile during baseline), and (e) behavior of staff (e.g., initiating teaching opportunities, use of reinforcement). On these topics, several suggestions are made for clinical practice and future research.





## **Samenvatting**



## Samenvatting

De alledaagse, praktische (adaptieve) vaardigheden van volwassenen met een autisme spectrum stoornis zonder verstandelijke beperking (Hoogfunctionerend ASS– HFASS) zijn veelal zwakker dan hun cognitieve vaardigheden doen vermoeden. Gebleken is dat een hoger niveau van adaptieve vaardigheden bijdraagt aan betere uitkomsten tijdens volwassenheid. Het bevorderen van de adaptieve vaardigheden van adolescenten en jong volwassenen met HFASS is dan ook een belangrijk onderdeel van hun voorbereiding op het leven als volwassene. Onderzoek naar effectieve interventies om het adaptieve functioneren van personen met (HF)ASS te verbeteren heeft veelal plaatsgevonden bij kinderen en jong adolescenten. Procedures gebaseerd op de toegepaste gedragsanalyse (Applied Behavior Analysis – ABA) zijn hierbij het meest effectief gebleken. Dit roept de vraag op in hoeverre dergelijke gedragsmatige interventies effectief zijn in het verbeteren van de adaptieve vaardigheden van adolescenten en jong volwassenen met HFASS. In onderhavig proefschrift worden de resultaten gepresenteerd van een zestal studies op dit gebied. Allereerst worden de resultaten gepresenteerd van een systematische literatuurstudie naar de effectiviteit van gedragsmatige interventies in het bevorderen van adaptieve vaardigheden bij jong volwassenen met HFASS. Vervolgens worden vijf interventiestudies beschreven. Om het gebruik van de vaardigheden in alledaagse situaties te bevorderen (generalisatie) wordt in de interventies onder meer gebruik gemaakt van een variatie aan stimuli om het gewenste gedrag uit te lokken ('multiple exemplars'), zelfmanagement strategieën, visuele of digitale hulpmiddelen en/of 'common stimuli' (stimuli die zowel in de training setting als de natuurlijke setting aanwezig zijn). Eén van de studies is gericht op het gebruik van gedragsmatige technieken door trainers/begeleiders van personen uit de doelgroep. De resultaten van de studies worden geëvalueerd in relatie tot het functioneel gebruik van adaptieve vaardigheden in alledaagse situaties, initiatiefname in toepassing en/of instandhouding van vaardigheden over de tijd.

In *Hoofdstuk 2* worden de resultaten gepresenteerd van de systematische literatuurstudie. Het betreft publicaties in Engelstalige 'peer-reviewed' tijdschriften in de periode van januari 1990 tot augustus 2011. Twintig interventiestudies werden geselecteerd op basis van vooraf vastgestelde criteria; zes van deze studies waren gepubliceerd na januari 2010. De meeste studies ( $n = 8$ ) waren gericht op het verbeteren van sociale, interactieve vaardigheden. Overige studies waren gericht op het verbeteren van praktische academische vaardigheden ( $n = 6$ ), werkvaardigheden ( $n = 5$ ) en huishoudelijke vaardigheden ( $n = 1$ ). Geen

enkele studie was gericht op het verbeteren van vrijetijdsvaardigheden, ondanks de problemen die op dat gebied ervaren worden bij de doelgroep. Bij 19 studies werden na de interventie verbeteringen gevonden in (een deel van) de doelvaardigheden. Op grond van het gebruik van pre- of quasi-experimentele designs en/of onvoldoende methodologische transparantie werd de bewijskracht van acht studies als zwak ('suggestive') beoordeeld. Interventies betroffen veelal een combinatie van procedures. Veelbelovende procedurele componenten lijken technologische hulpmiddelen, zoals 'video modelling' of visuele richtlijnen in combinatie met zelfmanagement strategieën, bekrachtigende consequenties en/of correctieve feedback met gebruik van prompts. Effectmetingen in reguliere, alledaagse situaties hebben slechts beperkt plaatsgevonden in de studies. Op basis van deze literatuurstudie wordt onder meer aanbevolen om in vervolgstudies bij de doelgroep gebruik te maken van zogenaamde *true experimentele designs*, effecten van de interventie te meten bij, relatief gezien, meer deelnemers ( $N > 5$ ) en meer personen vanaf 20 jaar en data te verzamelen over de generalisatie en instandhouding van adaptieve vaardigheden in reguliere situaties.

In *Hoofdstuk 3* worden de resultaten gepresenteerd van een studie gericht op het leren stellen van correcte vragen tijdens het begeleidingsgesprek met de persoonlijke coach. Negen jong volwassenen met HFASS namen deel aan de studie. Zes interventiesessies vonden plaats in een groepsopzet ( $n = 3$ ) in een gesimuleerde, experimentele setting. Resultaten werden verzameld tijdens het reguliere begeleidingsgesprek in de dagelijkse leefruimte van de deelnemer (generalisatie). Het interventiepakket bestond uit discriminatietraining, praktische oefening in rollenspel met de onderzoeker, aanleren van een zelfmanagement strategie, gebruik van 'multiple exemplars' en 'common stimuli', correctieve feedback met 'least-to-most prompting' en bekrachtiging. Het interventiepakket was effectief in het generaliseren van het 'vragen stellen' naar de reguliere setting; resultaten bleken gehandhaafd bij follow-up metingen na 1 maand. In de studie werd gecontroleerd voor alternatieve verklaringen voor de bevindingen, zoals het gebruik van stilte prompts door begeleiders en toegenomen aandacht.

De interventie beschreven in *Hoofdstuk 4* betreft het gedrag van trainers tijdens de reguliere arbeidstraining van adolescenten met HFASS. Het interventiepakket ('behavioral skills training' – BST) was gericht op het bevorderen van het correct gebruik van (a) bekrachtiging en (b) respons correcties en (c) het initiëren van leermomenten. Het gebruik van deze trainersvaardigheden werd gemeten bij een specifiek doelgedrag van de adolescenten (vragen om hulp). Generalisatie effecten van de training werden vastgesteld bij een ander doelgedrag van de adolescenten (taakgericht werken). De doelgedragingen van de adolescenten werden eveneens gemeten. Voor elke trainersvaardigheid bestond de interventie

uit een eenmalige groepsinstructie (discriminatie training, rollenspel, 'multiple exemplars' en feedback) en zes individuele feedback sessies na afloop van een reguliere arbeidstraining. De interventie leidde tot een toename van het correct gebruik van trainersvaardigheden; de toename van het correct gebruik van respons correcties was statistisch significant. Effecten bleven gehandhaafd bij de follow-up na 2 weken. De toename van het correct gebruik van bekrachtiging lijkt het resultaat van een generalisatie effect van de interventie die gericht was op het initiëren van leermomenten. Bij de adolescenten was sprake van een toename van het aantal hulpvragen. Generalisatie van de trainersvaardigheden over de doelgedragingen van de adolescenten vond evenwel beperkt plaats. In vervolgonderzoek wordt aanbevolen de inhoud van de (proces) feedback aan te vullen met outcome feedback en het aantal feedback sessies te verhogen. Voor het verbeteren van de generalisatie effecten wordt aanbevolen rollenspel scenario's systematisch te selecteren op basis van reguliere trainingssituaties ('common stimuli') en gebruik te maken van aanvullende technieken zoals zelfregistratie.

In *Hoofdstuk 5* worden de resultaten beschreven van een poliklinisch aangeboden vrijetijdsprogramma voor adolescenten en jong volwassenen met HFASS die bij hun ouders of (begeleid) zelfstandig wonen. In totaal hebben 12 personen deelgenomen. Het is de enige studie waarbij geen multiple baseline design, maar een pre-test-post-test controlegroep design werd gebruikt. Ter bevordering van de generalisatie is gebruik gemaakt van 'common stimuli', 'multiple exemplars', zelfmanagement strategieën, huiswerkopdrachten en geleidelijke afbouw ('fading') van interventie sessies. Gegevens werden verzameld aan de hand van vragenlijsten bij deelnemers ('self-reports') en verwanten ('proxy reports') en betroffen het vrijetijdsgedrag van de deelnemer in de reguliere, alledaagse situatie (generalisatie). De volgende variabelen werden gemeten: (a) hulpbehoefte bij het managen van vrije tijd, (b) invulling van vrije tijd en (c) tevredenheid met vrije tijd (deelnemer). Ten aanzien van de variabelen 'hulpbehoefte' en 'tevredenheid' zijn er binnen de experimentele groep ( $n = 7$ ) statistisch significante pre-post veranderingen gevonden na interventie ('self-reports'); binnen de controlegroep zijn op deze gebieden geen significante pre-post veranderingen gevonden. Tussengroep vergelijkingen lieten grote tot matige effectgroottes zien, ten gunste van de experimentele groep, voor de veranderingen in 'hulpbehoefte' (afname) en 'tevredenheid' (toename). Bevindingen betreffende de 'vrijetijdsinvulling' waren minder overtuigend. De pre-post verschillen in data van de 'proxy reports' ( $n = 5$ ) bleken statistisch niet significant. Deelnemers lijken de veranderingen in 'hulpbehoefte' meer positief te beoordelen dan hun verwanten. In vervolgstudies wordt aanbevolen gebruik te maken van gedragsmetingen (bijvoorbeeld zelfregistratie) om een meer accuraat beeld te

krijgen van het gedrag. Ter bevordering van de generalisatie van geleerde vaardigheden over situaties wordt aanbevolen bij poliklinische interventies het reguliere ondersteuningssysteem van de deelnemer te betrekken.

In *Hoofdstuk 6* worden de resultaten beschreven van een tweede studie in een gesimuleerde (experimentele) setting. De eerste studie (zie *Hoofdstuk 3*) was gericht op het stellen van vragen. De interventie in deze studie was gericht op het bevorderen van het taakgericht werken van zes jong volwassenen met HFASS. Effecten werden gemeten in de reguliere arbeidstraining situatie van de deelnemers (generalisatie). De inhoud van het interventiepakket stemde grotendeels overeen met het interventiepakket dat gebruikt werd in de studie van *Hoofdstuk 3*. Ter bevordering van de generalisatie werden onder meer onbekende werktaken ('multiple exemplars') gebruikt. Daarnaast werd de praktische oefening aangevuld met een tijdsaspect vanwege de kenmerken van het doelgedrag. Ook in deze studie leidde de interventie tot een statistisch significante toename van het doelgedrag in de reguliere situatie (generalisatie). Deze toename van het doelgedrag kon niet worden toegeschreven aan een toename van het gebruik van prompts of bekrachtigers door de reguliere trainers. Effecten bleven gehandhaafd bij de follow-up na 6 weken. Bij aanvullende follow-up metingen na zes maanden werd een lichte afname van het taakgericht werken gevonden, maar het niveau was nog steeds hoger dan tijdens de basislijn.

De interventie beschreven in *Hoofdstuk 7* werd uitgevoerd in een reguliere setting (leefruimte dagbehandeling). Vier adolescenten met HFASS namen deel aan de interventie die werd uitgevoerd door de dagelijkse begeleiders. De interventie was gericht op het bevorderen van het zelfstandig (zonder prompts van begeleiders) initiëren en correct uitvoeren van transities tussen activiteiten in een dagprogramma. In deze studie werden ook gegevens verzameld over de prompts die begeleiders gebruikten om correcte transities uit te lokken bij de deelnemers ('controlling prompt'). Tijdens de interventie kreeg elke deelnemer een digitale coach (iPod Touch), met ingesteld tijdsalarm en individuele instructies, als hulpmiddel om zelfstandig transities te initiëren en correct uit te voeren. De interventie bestond uit (a) een eenmalige technische instructie in het gebruik van de digitale coach en (b) het geven van één niet-specifieke prompt (globale aanwijzing) bij een incorrecte transitie om het gebruik van de digitale coach uit te lokken. De interventie leidde tot een statistisch significante toename van het doelgedrag en afname van geprompte transities door begeleiders. Tijdens de post-interventie fase bleven de resultaten grotendeels gehandhaafd. Bij de follow-up metingen na 4 tot 6 weken bleken de effecten gehandhaafd bij de twee deelnemers die de digitale coach nog steeds gebruikten. De natuurlijke context van de training en de digitale coach kunnen

beschouwd worden als ‘common stimuli’ die de toepassing en instandhouding van de vaardigheden in de reguliere setting bevorderd hebben. Vergelijking van de gegevens over het prompt gebruik door begeleiders, tussen basislijn en interventie, toont aan dat de afname van geprompte transities tijdens de interventie toe te schrijven was aan een statistisch significante afname van transities die uitgelokt werden met een niet-specifieke prompt (‘controlling prompt’); het aantal transities waarbij een verbale instructie de ‘controlling prompt’ was bleef gelijk tussen basislijn en interventie. Deze bevinding suggereert dat het aanleren van zelfmanagement (in combinatie met een digitale coach) bemoeilijkt kan worden door de aard van de prompt die het gedrag controleert (prompt afhankelijkheid). Ter bevordering van de klinische relevantie van de effecten wordt onder meer aanbevolen in vervolgstudies aandacht te besteden aan het afbouwen van het gebruik van verbale instructies door begeleiders.

In het laatste hoofdstuk, *Hoofdstuk 8*, worden de methoden en resultaten van de studies in onderhavig proefschrift met elkaar vergeleken en bediscussieerd. Geconcludeerd kan worden dat gedragsmatige interventies, waarbij zelfmanagement strategieën worden aangeleerd in combinatie met visuele of digitale hulpmiddelen, effectief zijn om adaptieve vaardigheden te bevorderen, generaliseren en in stand te houden bij adolescenten en jong volwassenen met HFASS. Bevindingen worden bediscussieerd in relatie tot kenmerken van (a) interventieprocedures (zoals aard van de error correctie procedure), (b) interventie condities (zoals gesimuleerde versus natuurlijke settings), (c) doelgedrag (zoals complexiteit van vaardigheden en aard ‘controlling prompt’), (d) individuele deelnemers (zoals het profiel van vaardigheden in de basislijn) en (e) gedrag van trainers (zoals het initiëren van leermomenten en het gebruik van bekrachtiging). Op deze gebieden worden diverse aanbevelingen gegeven voor de klinische praktijk en toekomstig onderzoek.





## **Curriculum Vitae**

Annemiek Palmen was born and has grown up in Maastricht, the Netherlands, where she finished high school in 1975. After that, she started her study at the Department of Special Education at the University of Nijmegen. During the last year of her study, she participated as an assistant in a research project on determinants of diurnal bladder control with institutionalized individuals with intellectual disability. In 1983 she finished her study during which she specialized in 'developmental disabilities'.

After finishing her study, she worked as a behavioral scientist in ambulant and clinical settings for developmentally disabled persons. Next to this, she participated in a research project which aimed at decreasing self-injurious behavior in individuals with intellectual disability by teaching them communicative gestures (see List of publications). Furthermore, she has been working as a teacher at the Katholieke Leergangen in Sittard and educated students on behavioral interventions in decreasing problem behavior in persons with developmental disabilities. Since 1988, she has been a teacher at the Department of Special Education at the Radboud University of Nijmegen where she teaches and supervises bachelor- and master students. For some years, she also has been affiliated as a teacher at SPON, a facility for educating psychologists in Nijmegen. At present, she is still working as a teacher at the Radboud University of Nijmegen. In 2005, together with several of her colleagues at the department, she received an University award (i.e., 'Universitaire Onderwijsprijs') for the high educational quality of the bachelor course entitled 'Behandelingsmethodiek', in which students are educated on methods of analyses and intervention.

Since 1989, she also is affiliated with the Dr. Leo Kannerhuis, a specialized Centre for Autism in the Netherlands. There, she got involved with the treatment of youth and young adults with high-functioning autism spectrum disorder (HFASD). Since the end of 2004, she is affiliated with the department of Research & Development at the same facility, where she is involved with research projects on adaptive behavior in persons with HFASD. Her research as well as clinical interests include, among others, behavioral assessment, training, and generalization of adaptive skills in adolescents and young adults with HFASD and training staff in implementing behavioral interventions in adaptive skill building.



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## **Dankwoord**

Dertig jaar na mijn afstuderen als orthopedagoog aan de Katholieke Universiteit van Nijmegen, hoop ik vandaag bij dezelfde universiteit (maar met een andere naam) te promoveren op basis van onderhavig proefschrift. Nieuwsgierigheid naar effectieve methoden om de alledaagse redzaamheid van mensen met een ontwikkelingsstoornis te verhogen heeft ten grondslag gelegen aan dit proefschrift. Een nieuwsgierigheid die onder meer gevoed is door kennismaking met het model van de toegepaste gedragsanalyse tijdens mijn doctoraal studie, waarbij Prof. Dr. Pieter Duker voor mij een belangrijke leermeester is geweest.

In mijn werk bij het Dr. Leo Kannerhuis ben ik in contact gekomen met adolescenten en jong volwassenen met een autisme spectrum stoornis (ASS) die op weg zijn naar een leven in de maatschappij. Behandelvragen van deze personen zijn vaak gericht op het verhogen van de praktische redzaamheid. De zoektocht naar effectieve behandelmethoden heeft geleid tot diverse studies samen met studenten van de afdeling Orthopedagogiek van de RU Nijmegen. Dat hier een promotie uit zou kunnen voortkomen was niet een van mijn eerste gedachten. Die optie kwam aan de orde toen ik binnen het Dr. Leo Kannerhuis de mogelijkheid kreeg me meer te focussen op wetenschappelijke studies en internationale publicaties. De boodschap van Pieter Duker was kort en krachtig “richt je aandacht op internationale publicaties die promotie komt dan wel”. Zo is het uiteindelijk ook gegaan. Met een planning en een deadline, waardevolle ondersteuning door onder meer Astrid van Dijk en Bibi Huskens van het Dr. Leo Kannerhuis en promotor Robert Didden en veel ‘zolderen’ (met geweldige ‘roomservice’) is het dan zover...en wat heb ik er veel van geleerd.

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