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**Title:** Communication problems in children with autism and intellectual disability: Depicting the phenotype  
**Date:** 2012-06-26
General conclusions and discussion
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Children with an autism spectrum disorder (ASD) and an intellectual disability (ID) form a particularly vulnerable group, as both disorders have a significant impact on the way and level of information processing and communication (Boucher et al., 2007; Noens & Van Berckelaer-Onnes, 2004). ASD and ID are usually accompanied by severe communication problems, which may lead to challenging behavior (Bott et al., 1997; Chung et al., 1995). However, children with ASD and co-occurring ID are often excluded from research. Knowledge with regard to the communication skills of this particular group is greatly lacking. Therefore, the main objective of this dissertation concerned the assessment of communication characteristics in children with autistic disorder (AD) and co-occurring ID in order to determine how children with AD and ID are similar and different in their communication compared with children with ID and typical development (TD). The study focused on problems in functions, forms, and content of communication. In this chapter, the general conclusions will be presented and discussed in relation to limitations and implications for clinical practice and research purposes.

Assessment of autism spectrum disorder in children with intellectual disability

The first step in the present study was to examine the psychometric properties and clinical value of instruments for identification of ASD in children with ID. The diagnosis of ASD in individuals with ID can be complicated, especially in those with severe or profound ID (Bhamuk et al., 2010). It is therefore important to evaluate the tools used to diagnose ASD in the ID population. The Diagnostic Interview for Social and Communication Disorders version 11 (DISCO; Wing, 2006) is a standardized interview that professionals can use to diagnose ASD. It was designed for any age and any level of ability, but the psychometric properties of the DISCO for ASD diagnosis in ID had never been determined. This study evaluated how well the DISCO algorithm, relative to other tools commonly used to diagnose ASD, can differentiate between children with and without ASD at different levels of intellectual ability. The instruments used for comparison were the Social Communication Questionnaire (SCQ; Rutter et al., 2003) and the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999; Gotham et al., 2007). For this study, we focused on the whole ASD spectrum, because not all instruments differentiate between AD and ASD. The results of this study into the psychometric properties of ASD screening and diagnostic instruments were used in order to decide which instruments would be applied to compose the research and comparison groups for our subsequent studies.

With respect to the utility of the DISCO as a diagnostic instrument for ASD in individuals with ID, two main conclusions can be drawn (see Chapter 2). First, sensitivity and specificity rates for the three instruments were compared. The results indicated that the DISCO is a very sensitive instrument, which implies that a high proportion of
children with and without ID were correctly classified as having ASD. However, the DISCO proved to be over-inclusive in the group of children with moderate or severe ID. In this low-functioning group, children without a clinical ASD diagnosis were frequently incorrectly classified as having ASD on the DISCO. The SCQ proved to be a very specific screening instrument with a considerable likelihood of false negative outcomes. The best rate between sensitivity and specificity was found for the ADOS. Second, the agreement between the DISCO and other tools for screening or diagnosing ASD was moderate to substantial.

Possible explanations for different outcomes of the three instruments include the content of information gathered, the sources of information, and the proposed target group of the instruments. With respect to the content of information, the SCQ is the shortest and least time consuming instrument with the most limited scope of information of the three instruments. Furthermore, the questions about communication impairments mainly focus on language characteristics and are therefore less applicable for nonverbal low-functioning children. In the ADOS, the emphasis is also on the three main criteria for ASD, but the items are more specified and the standardization is explicitly customized for verbal and nonverbal children. The DISCO covers the widest range of developmental domains and atypical behaviors, but no difference is made between verbal and nonverbal individuals in the algorithms used for the classifications. It is also important to take into account that the classifications of the instruments are based on different sources of information. The SCQ is a parent questionnaire, whereas the DISCO is an interview administered from the parents, but scored by a professional. The assessment of the ADOS concerns an observation of the child by a professional. Parents and professionals may have different perceptions about the behavior of children (Barnhill et al., 2000; De Los Reyes & Kazdin, 2005). The SCQ is specifically developed for children of four years and older or with a mental age over two years, whereas the ADOS and DISCO cover a broader developmental and chronological age range. However, our participants were partly younger or lower functioning than the target group of the SCQ. Furthermore, the SCQ was designed for screening purposes and both the ADOS and the DISCO as diagnostic instruments. A screening instrument is designed to identify individuals at risk for a disorder; hence a greater emphasis should be placed on the sensitivity. In our study, the SCQ was not effective as a screening instrument in low-functioning individuals. The major problem of the relatively poor sensitivity of the SCQ seems to be the prescribed cut-off score, as higher sensitivity rates would be achieved when the cut-off score was reduced, in line with previous studies with young children (e.g., Corsello et al., 2007; Snow & Lecavalier, 2008). Based on the raw scores, the DISCO has the potential to make an adequate differentiation between children with ID with and without ASD, but the current algorithms and cut-off scores are not sufficiently adjusted to this low-functioning group. The present findings suggest that clinicians and researchers should use caution when using the current
standards for classification of the DISCO and SCQ with individuals with moderate and severe ID.

Assessment of ASD involves an in-depth investigation by experienced clinicians. An ASD diagnosis is based on clinical judgment, aided by the combined results of various instruments and the guidelines as formulated in the DSM-IV-TR and ICD-10 (Filipek et al., 1999). A classification on the basis of a single screening or diagnostic instrument is not sufficient in order to make a clinical diagnosis. The current study only evaluated the final classification on the instruments. The diagnostic instruments also provide an extensive amount of qualitative information, but the usefulness of this information for the diagnostic process was not evaluated in this study. The ADOS and DISCO together provide a broad description of the child’s behavior. The assessment with the ADOS gives the opportunity to observe the child’s behavior in structured and semi-structured situations (Lord et al., 2000). A detailed interview with the parents, such as the DISCO, gives information about the developmental history, current behavior, and level of functioning in several developmental domains at home or in other settings (Wing et al., 2002). Research has shown that a combination of both methods is more reliable and stable over time (Risi et al., 2006). The ADOS and DISCO can shed light on the child’s strengths and weaknesses. This information can be used for an individualized, descriptive diagnosis and to devise an individualized treatment plan (Wing, 2006).

To compose our research group with AD and ID, the ADOS and DISCO together were used to confirm the previously given clinical diagnosis. For the comparison groups of children with ID without ASD and the typically developing group, the ADOS was administered to exclude possibly undiagnosed ASD cases.

**Communication in low-functioning children with autistic disorder**

Communication characteristics of children were examined with respect to communicative functions, forms, and content. The results of the present study will be discussed in this order. The main findings of the studies are summarized in Table 7.1.

**Communicative functions**

As described in Chapter 3, we observed communicative functions of low-functioning children with autistic disorder in comparison with typically developing children groupwise matched on nonverbal developmental level. Three basic functions were assessed: behavior regulation (acts to regulate another’s behavior for purposes of requesting or protesting), social interaction (acts to draw another’s attention to oneself for social purposes), and joint attention (acts to direct another’s attention to interesting objects or events for the purpose of sharing). Overall the findings suggest that low-functioning children with AD communicated at a significantly lower rate than typically developing children with a comparable developmental level. For this reason, the absolute frequencies of functions were converted into relative frequencies or
proportional use in order to compare the communication profiles independent of the total amount of intentional communication. Nonverbal children with AD were severely impaired in both the absolute and relative use of the different communicative functions. In the nonverbal group some children communicated only a few times during the whole observation. These children did not seem to know how to influence the behaviors of others in an intentional way. Other children in the nonverbal group showed intentional communication, but communicative acts for behavior regulation covered the greater part of their communication initiations. They did not communicate for social interaction and joint attention purposes or only to a small extent. An important difference in the type of functions which are coded within each of these communication functions is that behavior regulation serves a less social function compared to social interaction and joint attention (Wetherby & Prizant, 2002). The differences between verbal children with AD and typically developing children were less pronounced. The relative frequency of function use is comparable between both groups, although the absolute frequency of communication for joint attention is lower for verbal children with AD.

**Table 7.1** Main findings on communication in children with autistic disorder and intellectual disability

<table>
<thead>
<tr>
<th>Function</th>
<th>Nonverbal</th>
<th>Verbal</th>
</tr>
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<tbody>
<tr>
<td>Behavior regulation</td>
<td>- Relative strength (Ch3)</td>
<td>- Relative strength (Ch3)</td>
</tr>
<tr>
<td>Social interaction</td>
<td>- Not or only scarcely present (Ch3)</td>
<td>- Only differences in absolute not in relative frequencies compared with TD (Ch3)</td>
</tr>
<tr>
<td>Joint attention</td>
<td>- Not or only scarcely present (Ch3)</td>
<td>- Only differences in absolute not in relative frequencies compared with TD (Ch3)</td>
</tr>
<tr>
<td>Unclear</td>
<td>- Not or only scarcely present (Ch3)</td>
<td>- More frequently present than in nonverbal AD+ID and TD (Ch3)</td>
</tr>
<tr>
<td>Form</td>
<td>Nonverbal</td>
<td>Verbal</td>
</tr>
<tr>
<td></td>
<td>- Overall substantially lower complexity than verbal AD+ID &amp; TD (Ch3)</td>
<td>- Verbalizations less often combined with both gestures and eye gaze for joint attention compared with TD (Ch3)</td>
</tr>
<tr>
<td></td>
<td>Verbal*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Significant delays in receptive and expressive language (Ch4)</td>
<td>- Opposite profile from TD and ID: expressive &gt; receptive language (Ch4)</td>
</tr>
<tr>
<td></td>
<td>- Receptive and expressive language significantly related to joint attention and symbol understanding (Ch4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not applicable</td>
<td></td>
</tr>
<tr>
<td>Augmentative*</td>
<td>Nonverbal</td>
<td>Verbal</td>
</tr>
<tr>
<td></td>
<td>- Stronger local processing of pictures and objects compared to ID with and without deafness (Ch6)</td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>Level of sense-making*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Significantly lower levels of sense-making compared with ID and TD (Ch5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- At non-symbolic levels of sense-making: more severe problems in social interaction and communication (Ch5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Level of sense-making is an important underlying factor for adaptive delays (Ch5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Non-symbolic levels of sense-making are associated with more severe autism symptomatology (Ch5)</td>
<td></td>
</tr>
</tbody>
</table>

*Analyzed for the AD+ID group as a whole, no subdivision in verbal and nonverbal groups was made.

It is important to note that the results reflect communication profiles during the Communication and Symbolic Behavior Scales – Developmental Profile (CSBS-DP) administration only, and can only be generalized to a certain extent. Factors that may influence the communication profiles are the semi-structured nature of situation,
unfamiliarity with the situation and the materials, and explicit prompting of communication. However, a standardized observational measurement procedure provides a more stable estimate of a child’s performance and enables a reliable comparison between groups (Yoder & Simons, 2010).

In conclusion, communication for joint attention purposes is a major obstacle for low-functioning children with AD. Other studies pointed out that this characteristic also differentiates ASD from other developmental disorders in young children (Dawson et al., 2004; Wetherby et al., 1998). Joint attention involves triadic information processing, while behavior regulation and social interaction are mainly dyadic. When children are engaged in joint attention, they have to turn their attention to and process information about: an object or event, another person’s attention and behavior related to the object, and information about their own attention to, and experience of the object and the situation (Mundy & Jarrold, 2010). Recently, Mundy and Jarrold (2010) proposed a new explanatory model of joint attention, called the Parallel and Distributed-Processing Model (PDPM). Although prerequisites and emergence of joint attention remain unclear, this model illustrates the complex and interactive nature of joint attention development. According to this model, three important aspects contribute to the development of joint attention. First, complex information processing of parallel self-referenced, other-referenced, and object- / event-referenced information is involved. Second, development originates from continual practice and children generate knowledge through their own initiated actions. Third, it is likely that this process is affected by and has an effect on the flow of information between brain areas (Mundy et al., 2009; Mundy & Jarrold, 2010; Mundy et al., 2010). It can be expected that problems will arise when any of these three components of joint attention development are disrupted or compromised. Children with ASD demonstrate significant difficulties in their ability to attend to and process information about another person’s attention and behavior and incorporate the perspective of others into their communicative behavior (Nilsen & Fecica, 2011). Simultaneously, impairments in ASD could arise from disturbances in initiation, resulting in diminished experience and practice (Dawson et al., 2004; Klin et al., 2002). A growing body of evidence suggests that impairments in distributed brain systems are involved in joint attention problems seen in ASD (Müller, 2007; Rudie et al., 2011).

Communicative forms
Communicative intentions can be expressed in several ways, differing in quality from very primitive forms to more conventional forms, such as spoken language. In our study, several forms or means of communication were assessed. First, spontaneous naturalistic forms used for expressive communication were observed. A distinction was made between verbalizations, gestures, and use of eye gaze. Second, we zoomed in on the use and comprehension of verbal language. And third, comprehension of augmentative communication forms was examined.
Nonverbal and verbal communication. Previous studies examined the quantitative use of several expressive communication forms in children with ASD. In our study, not the quantity of specific communicative forms, but the complexity of forms was evaluated by examining the degree to which communicative gestures, vocalizations / verbalizations, and eye gaze were combined in one communicative act. The results of our study (see Chapter 3) indicated that mainly nonverbal children with AD used very primitive forms of communication and combined their communicative gestures or vocalizations less often with eye gaze than verbal children with AD and typically developing children. With respect to verbal children with AD, results revealed group differences at the most complex level of communicative forms only. Verbal children with AD used a significantly lower proportion of acts involving gestures, verbalizations, and eye gaze for the purpose of joint attention relative to the typically developing control group.

Receptive and expressive language. Language is the most conventional form of communication. As described in Chapter 4, we found that in the group of children with AD and ID, expressive and receptive language skills were substantially lower than their nonverbal cognitive level. In contrast, in both comparison groups language levels approximated the nonverbal cognitive level, except for expressive language in the ID group. Further, children with AD and ID had considerably better language production than comprehension skills, which is a pattern that is reversed in children with ID and typically developing children. These findings suggest that children with AD and ID who have some spoken language may well be overestimated on the basis of relatively good language production skills. The findings in low-functioning children with ID are in line with the results for toddlers with ASD (e.g., Hudry et al., 2010; Miniscalco et al., 2011; Weismer et al., 2010), but differ from results in older high-functioning children with ASD (Jarrold et al., 1997; Kjelgaard & Tager-Flusberg, 2001). The findings of the current and previous studies together indicate a discrepancy in language profiles between high and low-functioning children with ASD. In high-functioning children the difference between receptive and expressive skills seems to diminish as they grow older, while in low-functioning children with AD an atypical language profile remains present after early childhood.

Joint attention and symbolic thinking are defined as important precursors for language development in young children and are considered to be core deficits in communication development of children with ASD (Travis & Sigman, 2001). In our study both aspects were assessed in relation to concurrent receptive and expressive language abilities in children with AD and ID (see Chapter 4). In the comparison groups with ID and TD nonverbal mental age was strongly related to these precursors and the most robust concurrent predictor of both language comprehension and production. However, in the low-functioning AD group symbol understanding and joint attention made a significant and unique contribution to concurrent expressive and receptive language.
abilities. This finding suggests that in contrast to the homogeneous development in typical development, developmental profiles in ASD are more disharmonious and language abilities are more independent from nonverbal cognitive level of functioning. Joint attention has often been indicated as an important predictor of language outcome in toddlers with ASD (e.g., Charman et al. 2003; McDuffie et al. 2005). The role of symbol understanding, however, has seldom been scrutinized in relation to language skills. The nature of the relationship between joint attention and symbol formation and the relative contribution of both precursors to language development remain unclear. A study by Warreyn and colleagues (2005) suggested that social communicative skills, such as joint attention, develop independently from symbolic abilities in children with ASD. According to the PDPM of joint attention, the practice with joint attention contributes to the neurocognitive foundation of symbolic thinking (Mundy et al., 2009), as learning the meaning of a symbol usually implies a social activity consisting of both a producer who intends to convey information via a representational form and a recipient to whom this information is directed (DeLoache, 2004; Namy & Waxman, 2005). In this way joint attention can be helpful in learning symbol-referent relations (DeLoache, 2004). Accordingly, Toth and colleagues (2006) pointed out that joint attention is an important skill for the start of language development, while symbolic play - which refers to more representational or symbolic skills - is associated with the continued development and the expansion of language abilities in later years. In our study, both joint attention abilities and symbol understanding had a unique contribution to the level of concurrent language skills, but the contribution of symbol understanding was more pronounced. Also in children with AD, joint attention abilities increase with age (Naber et al., 2008), and probably become less important in language development in older children with AD, which explains the major role of symbol understanding. Furthermore, based on the results of Chapter 5 which highlights that problems in sense-making and symbol formation are specific for children with AD, it can be hypothesized that children with AD develop symbol understanding at a later stage or in an atypical way. Therefore, the role of symbol understanding might be more prominent in this group.

**Augmentative communication forms.** Many low-functioning children with ASD remain nonverbal or have only a limited number of communicative words or gestures. These individuals are dependent on other communication forms. Several communicative forms can be used to augment communication. Both three-dimensional forms (visuospatial objects) and visual, two-dimensional forms (pictures) were assessed with the ComFor. These assessments were used for the studies described in the Chapters 5 and 6. In Chapter 6, perception and processing of visual and tactile information (objects and pictures) were examined. Problems in symbolic communication in ASD, especially with respect to the content of communication or the establishment of meaning, can possibly be explained by a weaker central coherence. Central coherence refers to the natural tendency to process incoming stimuli in context, drawing pieces of information
together to derive meaning (Happé & Frith, 2006). In children with ASD, central coherence is rather weak, primarily resulting in a detail-focused processing style often accompanied by a failure to process information in context (Happé & Booth, 2008). Enhanced local processing skills were found in individuals with ASD and ID in a previous study by Noens and Van Berckelaer-Onnes (2008). We examined the effects of co-occurring deafness on visual perception in low-functioning individuals with ASD to investigate the specificity of this enhancement and explored whether a weak central coherence may be an underlying cognitive mechanism contributing to the visual processing style in individuals with ASD with and without deafness. The results showed that hearing as well as deaf individuals with ASD and ID have stronger local processing skills of pictures and objects compared to individuals with ID. It is important to stress that the terms enhanced visual perception and superior local processing in this context are used as relative statements, considering the ID of all participants. Although this processing style can hinder in tasks or situations where global information processing is useful or even necessary, our findings also provide evidence that individuals with ASD can ‘benefit’ from a weak central coherence. These relative strengths in visual perception can be used to augment communication.

**Communicative content**

Concerning communicative content, we focused on the question whether content is understood in a symbolic or non-symbolic way, and on the consequences of both ways of sense-making or perception of meaning. As described in Chapter 5, the present study revealed that difficulties in sense-making are more pervasive in children with AD and ID compared to typically developing children, but also compared to children with ID without ASD. In the group with AD, significantly fewer children achieved the level of representation. A large part of this group is only able to perceive the world at the levels of sensation or presentation, which implies that they do not (completely) understand the symbolic or representational content of communication. In particular low-functioning children with ASD are not always able to grasp the symbolic meaning of communication (Preissler, 2008). Communicative forms and contents must be directly linked to function and context in order to establish accurate meaning and sense-making (Quill, 1995). Children with ASD are less able to adapt and respond to the rapidly moving, fluid context of communication that demands flexibility (Landa, 2007). They can deal more effectively with concrete, non-transient stimuli. Therefore, children with ASD have a preference for visual-spatial information instead of temporal, auditory information (Twachtman, 1995). In nonverbal children, level of symbolic understanding of other communication forms, such as pictures or objects, also needs to be assessed (Paul, 2005). Based on our results, level of sense-making seems to be an important underlying factor for adaptive delays and more severe autism symptomatology. Mainly children with AD and ID at the non-symbolic levels (sensation and presentation) are impaired in adaptive functioning on the domains of communication and socialization.
compared with their nonverbal mental age matched controls with either ID or typical development. Non-symbolic levels of sense-making are also associated with more severe autism symptomatology in terms of quality of communication, social interaction, and imagination.

**Limitations and directions for future research**

Research into communication in children with ASD and co-occurring ID is done less often compared to studies in higher functioning children with ASD. The results of this study in terms of impairments in intentionality, use of communicative functions, and language abilities, show many similarities with communication and language results in toddlers with ASD. Not completely surprisingly, as the developmental level of the children in our research group is situated in the toddler age range. However, the problems in the group with children with AD and ID seem to be more aggravated and pronounced. Unfortunately, we were not able to compare our results with a comparison group of young children with AD without ID with a comparable developmental level. The use of additional comparison groups, one with children with AD without ID (for all Chapters), and another with children with ID without AD (for Chapter 3), is an important recommendation for future research. Due to the very comprehensive way of data collection, especially concerning the observations of communicative functions and forms, this was currently not attainable in our study. It will be an important next step, but also a complicated one, as it is difficult to compose a comparison group of toddlers with AD without ID. When these groups have to be comparable with respect to nonverbal mental age, this has to be a relatively young group with autism. Although early diagnoses of ASD are nowadays more common (Charman & Baird, 2002; Zwaigenbaum et al., 2009), confirmation of the absence of an ID at a young age is less obvious, as many young children with ASD have developmental delays. Given that the focus of our research is a clearly defined group, for which communication profiles were not studied yet, the results of this study can be considered exploratory in nature. Based on the current data, it is not possible to draw conclusions about which characteristics may be solely due to the AD and which to the co-occurring ID. We have tried to describe the characteristics of the group with co-occurring AD and ID as a whole to provide suggestions for assessment and treatment of communication problems in this vulnerable group.

Another concern with respect to our comparison groups are the gender differences between the groups. As ASD is more common in boys than girls, the majority of this group is male, while the distribution male versus female is more equal in the comparison groups. In our study, groupwise matching on nonverbal mental age was given priority over the gender variable. Ideally, groups would be matched on both variables. For that reason, we controlled for the influence of gender on the outcome variables in all chapters.
Several related and important research topics were not addressed in this study. First, it is recommendable to further explore the development of symbol understanding in young and low-functioning children with ASD in order to gain more insight in the course of development and possible deviations from typical development. Second, based on the literature a relation between communication problems and challenging behavior can be expected (Bott et al., 1997; Chamberlain et al., 1993, McClintock et al., 2003). As communication problems are rather divers in low-functioning children with ASD, it is important to examine the association between specific communication problems (e.g., in terms of problems in functions, forms, or sense-making) and challenging behavior in order to improve prevention and interventions.

**Clinical implications**

To diagnose ASD in children with ID, cognitive abilities always have to be specified and are an important component of the diagnostic process. Information about the child’s cognitive level of functioning provides the clinician with a context for evaluating behavioral symptomatology. This context can help to decide whether symptoms can possibly be explained by a global delay, and whether there is actually a developmental readiness for feature expression (Totsika et al., 2010; Vig & Jedrysek, 1999).

The results of this study showed that low-functioning children with AD have different impairments, at least in the social communication domain, compared to high-functioning children with AD. Concomitantly, a large heterogeneity of symptoms was observed within this low-functioning group. These results endorse the shift to a dimensional approach of impairments in ASD. The current classification systems are based on a predominantly categorical model with specific diagnostic criteria for different categories. In recent years, the conceptualization of ASD as a spectrum with different continua gained increased attention, partly due to the debates concerning the development of the DSM-5 (http://www.dsm5.org). The question is whether some major aspects of ASD might better be conceptualized in terms of quantitative dimensions (in analogy with for example IQ), instead of qualitatively distinct categories (Taylor & Rutter, 2002). In a categorical system behavioral characteristics are classified as either meeting criteria for a disorder or not based on qualitative criteria, in other words an ‘all or nothing’ approach (Kamp-Becker et al., 2010; Lilienfield & Landfield, 2008). The current categorical approach has been developed to improve reliability and validity of the classifications and research findings (Volkmar, 1998; Wing, 2005). However, reality is often more complex, resulting in the exclusion of a large number of children and overlap between several classifications. In line with the dimensional approach, difficulties in ASD are considered broad dimensions of individual variations that are widely distributed in the general population (Constantino & Todd, 2003). A disorder represents the severe end of continuous distributions of core symptoms (Constantino, 2011). Impairments in the three areas that characterize ASD are modified by many factors, for example chronological age, developmental level, language
functioning, and co-occurrence of other disorders (Hill & Frith, 2003; Volkmar & Lord, 1998). The ability to measure the severity of ASD dimensions would be useful for both research and clinical practice (Volkmar & Lord, 1998). Scientific evidence is necessary to validate the dimensions or spectra to diagnose and indicate severity.

Every child with ASD will have needs in the area of communication, since this is one of the core deficits in ASD. But the types and intensity of needs vary depending on age, level of functioning, and other characteristics (Paul, 2007). As we have seen in this study, even within the group of children with autistic disorder and co-occurring ID communication impairments are very heterogeneous. For this reason, assessment of communication always needs to be part of the diagnostic assessment of low-functioning children with ASD. In the case of nonverbal children, it will be particularly important to evaluate how they communicate in other ways, such as with gestures, gaze, and vocalizations, as well as their comprehension of the communication of others. Furthermore, the observation of intentionality and functions of communication needs to be included. Observation instruments, such as the Communication and Symbolic Behavior Scales – Developmental Profile (Wetherby & Prizant, 2002), or comparable situations which elicit the child to communicate, can be used in this target group. However, standardized scoring of the CSBS-DP is not sufficient. Many low-functioning children with ASD who lack the use of conventional means of communicating, may develop idiosyncratic, unconventional, or undesirable behaviors to communicate, such as self-injurious behavior or aggression (Paul, 2007; Wetherby et al., 2000). The use and functions of challenging behavior also need to be considered in the diagnostic process. For verbal children with ASD and ID, the usual and standardized tests for language development can be used. These will often need to be supplemented with observations of communication behavior in daily life situations to determine whether there is a disconnection between the level of language skills measured with standard tests and the use of language to achieve reciprocity and adequate exchange of information (Paul, 2007). Stimulation of communicative competence is an important goal in interventions in ASD. A common practice in communication intervention in young and low-functioning children with ASD is that of stimulation of verbal language (Twachtman, 1995). However, often there are not only severe delays in or a lack of speech, but also delays in the development of intentionality and symbol formation (see Chapters 3 and 4). This requires a broader communication intervention approach adjusted to their developmental level.

A significant part of mainly low-functioning children with ASD do not develop language or only a limited number of communicative words or gestures. Particularly in case of severe or profound ID, often no verbal or symbolic communication is present. These individuals are dependent on other communication forms, such as augmentative communication means. The need for individualized augmentative strategies to enhance the communication skills of low-functioning children with ASD is evident, given the severity of their language and communication impairments (Howlin, 2006). For low-
functioning children with ASD the common alternative and augmentative communication (AAC) systems are not directly applicable. Several principles of AAC, as formulated by the Committee on Augmentative Communication of American Speech Language Hearing Association (ASHA, 2005), do not correspond completely with the results of our study.

First, AAC is mainly focused on enhancing the expressive communication skills of individuals who have relatively good understanding of communication (Fossett & Mirenda, 2007; Wilkinson & Hennig, 2007). However, positive changes regarding this topic are included in the most recent definition of AAC, where also persons with comprehension problems are addressed. This definition draws attention to the unique communication needs of individuals who struggle to understand spoken language. In low-functioning and young children with ASD receptive skills are often relatively more impaired than expressive language abilities (see Chapter 4). In these target groups, initially strategies which aim to augment receptive communication need to be implemented. Augmentative communication can be used to announce activities or to help making transitions between activities. Further, it can be used to explain different steps within an activity or to teach sequences in several activities. When augmentative communication strategies are successfully implemented to support receptive communication, it can be used to encourage expressive communication as well. The child can be taught to use the same individualized strategies adjusted to the level of sense-making, for example to regulate the behavior of others or to make choices. The success of such an expressive intervention strategy is clearly related to the child’s ability to communicate intentionally (Rowland & Schweigert, 2000). Nonverbal low-functioning children with ASD are often severely impaired in the use of intentional communication (see Chapter 3). When some intentionality is present, it is important to build upon the existing communicative functions and previously learned communication skills to extend the expressive communication skills. It is essential that the child’s individual interests or needs are taken into account. Nevertheless, in many interventions which aim to stimulate the expressive communication, the focus of the training tends to be on teaching predetermined labeling skills. However, communication interventions are more likely to succeed if the child’s existing and spontaneous attempts to communicate function as starting points. In this way, the child is provided with greater control over the environment (Howlin, 2006). Communication profiles in terms of function use are variable among low-functioning children with ASD, thus need to be characterized before the start of an intervention (see Chapter 3). Furthermore, because of generalizations problems, communication skills have to be taught in regularly occurring, daily life situations, instead of teaching them in isolation. Thus, the context for skill development needs to be the same as the context for skill use (Howlin, 2006; Twachtman-Cullen & Twachtman-Reilly, 2007).

Second, in the definition of AAC communicative means, such as photographs, printed words, objects, are being used in a symbolic way. However, the results
concerning level of sense-making pointed out that not all children with ASD and co-occurring ID are able to understand the symbolic meaning of communicative forms. When symbolic augmentative communication strategies are used when someone is unable to understand the meaning of symbols, the result is likely to be a frustration for both the child and the clinician (Rowland & Schweigert, 2000). A frequently used symbolic AAC system is the Picture Exchange Communication System by which children learn to exchange a picture for a desired item (PECS; Bondy & Frost, 2001). A recent study of McFee (2011) showed that symbolic understanding of pictures was one of the factors that was related to effectiveness of the PECS intervention. Our study showed that a part of the low-functioning children with ASD did not (yet) reach the required level of representation or symbolic understanding of communicative means. Because of the limited symbol understanding in ASD, the level of sense-making has to be taken into account before starting an intervention (Noens & Van Berckelaer-Onnes, 2004). Level of sense-making for the indication of an individualized strategy for augmentative communication can be measured by using the ComFor (Verpoorten et al., 2004, 2008). Several non-symbolic strategies for augmentative communication were developed at the levels of sensation and presentation (see Noens & Van Berckelaer-Onnes, 2004). As reviewed by Rowland and Schweigert (2003), low-functioning children with ASD are often excluded from AAC services because they fail to demonstrate so-called prerequisite skills, such as object permanence, and as a result are thought not to be ready for symbolic communication. Wilkinson and Hennig (2007) make a case for a broader view on AAC by proposing AAC as a continuum that can range from simple social or turn taking routines through more sophisticated use of symbols. In our opinion, functions, forms and levels of sense-making, are mixed up in this explanation of possible applications of AAC. Augmentative communication is possible for each level of sense-making, as also non-symbolic strategies can be utilized. Furthermore, forms are independent of levels of sense-making, thus for instance objects can be used both in a non-symbolic or symbolic way to support communication. And lastly, different communicative functions can be encouraged at each level of sense-making and have to be considered independently from form and level.

**Concluding remarks**

In conclusion, the results of our study emphasize that a successful strategy for augmentative communication must aim not only to provide the child with more effective expressive means of communication, but also improve understanding - both verbally and nonverbally - and increase motivation to communicate (Howlin, 2006). Moreover, augmentative communication strategies are accessible for everyone, also for non-symbolic communicators, if adjusted to individual needs. Augmentative communication strategies are often applied in clinical practice. Thus far, effectiveness of individualized augmentative communication strategies at the levels of sensation and presentation has not been demonstrated. This study focused on the description of
communicative strengths and weaknesses in low-functioning children with ASD. Based on the current findings several suggestions for assessment and treatment of communication in this group were formulated. However, another clinical question concerns the validity of communication measures or effect of interventions that are provided for children with ID and ASD. Extending the knowledge on these issues is therefore highly recommended as the focus of future research.