

# LIFE SPAN AND DISABILITY

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Psychology  
Social issues  
Education  
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- A woman with multiple disabilities uses a VOCA system to request for and access caregiver-mediated stimulation events
- Consequences of Interest-Based Learning on the social-affective behavior of young children with autism
- TEACCH-based interventions for families with children with Autism Spectrum Disorders: Outcomes of a parent group training study and a home-based child-parent training single case study
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**Department of Psychology**  
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## LIFE SPAN AND DISABILITY

Psychology, Social issues, Education, Rehabilitation, Habilitation

Promotes interdisciplinary research about psychological, social, educational, rehabilitative and neuro psychological aspects of the human life span. The aim is to give diffusion to the scientific studies of persons who have to cope with cognitive and emotional and interpersonal problems – for transient or persistent reasons – in the different periods of the life, when specific existential events (e.g., adolescence, lost of work, retirement, end of fertility, normal and pathological aging) could cause disease or actual disability. The neuropsychological and social aspects of Intellectual Disability, and the strategies to enhance the cognitive rehabilitation and the quality of life of these persons, were a main target in the published studies. The attention is focused, for the different phases of life and for the specific conditions of disease, on the skills suitable to promote the person's development, fully using all the existing or residual potentialities. The view to consider these aspects may be in turn educational, social, environmental, but taking into account the connections with the bio-psychological bases and/or with the data derived from empirical research. Both quantitative and qualitative methodological approaches are welcomed.

The contributions received are submitted to two members of the scientific committee, for a blind peer-review process.

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## A woman with multiple disabilities uses a VOCA system to request for and access caregiver-mediated stimulation events

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### Abstract

*This study assessed a program involving the use of a voice output communication aid (VOCA), which was aimed at allowing a post-coma person with multiple disabilities to choose among stimuli/activities and ask for the mediation of the caregiver to access them. In response to the participant's choice (request) of a stimulus/activity verbalized by the VOCA, the caregiver could propose two alternatives of it and eventually provide the one that the participant seemed to prefer. Results showed that the program was effective in increasing the participant's successful requests and allowing her to access chosen stimuli/activities with a brief mediation of the caregiver. The practicality and implications of the program are discussed.*

**Keywords:** VOCA, Multiple disabilities, Choice, Caregiver mediation

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## 1. Introduction

A basic, preliminary objective of any programs for persons with severe multiple disabilities is to enable these persons to interact with the immediate context and control relevant stimulation events independently (Mechling, 2006; Lontis & Struijk, 2010; Borg, Larson, & Ostegren, 2011). The achievement of such an objective is largely connected to the availability of assistive technology and, in particular, of microswitches (Mechling, 2006; Lancioni, O'Reilly, Singh, Sigafos, Oliva, Antonucci *et al.*, 2008; Weightman, Preston, Holt, Allsop, Levesley, & Bhakta, 2010). Microswitches are devices that allow a person to activate stimulus sources with minimal responses that per se would not be adequate (sufficient) to handle those sources (Holburn, Nguyen, & Vietze, 2004). For example, a touch/pressure microswitch placed inside the palm of the person's hand may allow the person to activate a music box with a small hand closure response (Lancioni, O'Reilly, Cuvo, Singh, Sigafos, Didden *et al.*, 2007).

A subsequent objective of the programs may be that of extending the range of environmental stimuli available for the person and enabling the person to choose among them (Lancioni, Singh, O'Reilly, Sigafos, Buonocunto, Sacco *et al.*, 2011). With regard to this objective, a first approach may involve the use of multiple microswitches (each linked to a specific type of stimuli) that allow the person to choose among stimuli and to access those selected totally on his or her own (Lancioni *et al.*, 2011). One might also arrange an approach that entails a partial involvement of the caregiver, that is, the caregiver is called through the verbal request of a VOCA device to mediate the access to the stimuli (activities) that the person has chosen (Schlosser, 2003; Lancioni, Singh, O'Reilly, Sigafos, Oliva, & Cingolani, 2009; Sigafos, Green, Payne, Son, H., O'Reilly, & Lancioni, 2009; Rispoli, Franco, Van der Meer, Lang, & Höher Camargo, 2010). In this process, the caregiver can also present different alternatives of such stimuli/activities so that the person's choice opportunities increase. For example, the person may choose to watch video segments and call the caregiver to help with that through a VOCA request. The caregiver may intervene in response to that by allowing the person to choose between two different video segments (Lancioni, Olivetti Belardinelli, Stasolla, Singh, O'Reilly, Sigafos *et al.*, 2008).

This second approach would simultaneously promote the person's initiative in making requests/choices (seeking different stimuli/activities) and his or her opportunity to interact with the caregiver (increase his or her social contact and choice level) (Lancioni *et al.*, 2008; Kagohara, 2011). Given these social/emotional components, the second approach may be seen as highly attractive and, at the same time, as also relatively expensive in terms of caregiver's time (Mcintyre, Kraemer, Blacher, & Simmerman, 2004). To make such an approach realistic (affordable), one might need to ensure that (a) the mediation required to the caregiver for accessing the stimuli/activities amounts to a

momentary participation that is basically reconcilable with his or her regular duties, and (b) the sessions requiring the caregiver's mediation are part of a wider program that also includes technological solutions allowing the person to choose and access stimuli independently (Lancioni *et al.*, 2009, 2011).

This study was aimed at devising and assessing a basic application of the second approach (i.e., the one with caregiver mediation) for a post-coma woman with multiple disabilities. Although a relatively extensive literature exists on the use of VOCA for persons with severe/profound communication and multiple disabilities, this study was thought to add new evidence because it focused on an area (i.e., extended choice with social mediation) and on a type of participants that had attracted only a limited amount of attention so far (Lancioni *et al.*, 2009, 2011; Sigafos *et al.*, 2009; Rispoli *et al.*, 2010).

## 2. Method

### 2.1. Participant and Setting

The participant (Jenny) was 33 years old. She had congenital encephalopathy due to complications during pregnancy. Her level of intellectual disability had been estimated to be in the severe range, although no formal IQ scores were available. From her early childhood, she had been suffering from obesity and diabetes mellitus with respiratory problems, which could also be very severe. About 10 years prior to this study, she had incurred respiratory and cardiac arrest with subsequent coma. From that time she had been provided with a tracheostomy tube and artificial ventilation. This condition restricted her to bed or to a reclined wheelchair, and eliminated any form of productive verbal communication. Indeed, she tended to be isolated and only occasionally she resorted to eye-gazing or partial pointing as forms of requests concerning stimuli available in her immediate surrounding. These attempts could easily fail because they went unnoticed or were misinterpreted, particularly if the caregiver or other personnel were not directly watching her. This condition was considered very damaging in terms of communication and social-emotional interaction. In addition, it complicated her access to stimulation. Indeed, she would be allowed to access a few forms of stimuli directly through basic microswitch technology or would be provided with environmental stimulation determined by her caregivers rather than through her choice. Given this situation, the arrangement of a program that would allow her to request/choose stimuli/activities and access them through the mediation of the caregiver was thought to be a valuable goal. Moreover, Jenny seemed to be very interested in this approach. Her legal representative had provided formal consent for her participation in the study, which was approved by a scientific and ethics committee. The study was carried out in Jenny's room within the medical care center in which she was living.

## 2.2. *Technology, request/choice responses, and stimuli/activities*

The VOCA system used for allowing Jenny to request/choose stimuli/activities was a commercial (tablet-like) device provided with nine cells of 4.5 cm X 5.5 cm (Go Talk 9; Special Needs Products of Random Acts Inc., USA). Only five of those cells were used in this study. Each of these five cells was eventually provided with a pictorial representation of one of the stimuli/activities available (see below). Request/choice responses consisted of applying light pressure to any of these cells (pictorial representation). Each response made the system call the caregiver (research assistant) and ask her the possibility to access the stimulus or activity selected. The stimuli/activities included: songs, videos, ornamental material, paintings, and make-up items. Songs and videos included a variety of popular tunes and comedy or animated-film segments stored in a portable computer. Ornamental material included items, such as rings and bracelets, which could be tried on and worn briefly. Paintings included various series of picture cards representing persons and scenes that Jenny liked as well as coloring materials that could be used to complete drawings included in the series. Make-up items included materials such as a mirror, lipsticks, and creams. These sets of stimuli/activities were used for the study based on staff recommendations. That is, staff had confirmed that they were enjoyable for Jenny as shown by her smiles and active participation during their availability through time.

## 2.3. *Experimental conditions*

The study was carried out according to an AB<sup>1</sup>BAB design sequence (Barlow, Nock, & Hersen, 2009), with the A representing baseline phases and the B<sup>1</sup> and B representing intervention phases. Typically, two or three sessions per day were carried out. Sessions lasted until an interval of 20-25 min had elapsed. A research assistant recorded the responses performed and the stimuli/activities selected within the sessions. Interrater agreement was assessed in about 20% of the sessions with a second research assistant recording the aforementioned measures independently. Agreement (i.e., availability of matching scores from the two research assistants) was reported in 38 of the 39 sessions targeted for the assessment.

*Baseline (A) phases.* Each of the two baseline (A) phases included four sessions. The research assistant who carried out the sessions (a) was in the room with Jenny, busy in settling away things around the room, or immediately outside her room and (b) could talk to Jenny but generally without watching her for any specific length of time. Namely, the research assistant simulated the common daily situation Jenny experienced at the medical care center. If no requests occurred that the research assistant could understand, she would (a) suggest one stimulus/activity option to Jenny, and (b) eventually (e.g., once Jenny had acknowledged with a smile that she liked it), she presented such stimulus/activity to Jenny.

*Intervention (B<sup>1</sup>) phase.* This phase included 38 sessions that served to introduce the five pictorial representations used to indicate the five sets of stimuli/activities available (see above). Initially, a practice session was used with the representation of music. Jenny was guided (via verbal and physical prompting) to push such a representation on the VOCA tablet where it was attached. As soon as Jenny pressed it, a vocal request of listening to music was emitted (addressed to the research assistant) by the VOCA system. In response, the research assistant would present two music alternatives (e.g., the pictures and names of two singers) to Jenny and ask which alternative she wanted. Fixation/pointing of one alternative led the research assistant to turn on the file of that singer on the computer for about 2 min. Once, Jenny was requesting music appropriately, the intervention focused on the request of films. Only the pictorial representation of films was available on the VOCA tablet initially. Conditions matched those described above for music. Eventually, the pictorial representations of music and films were made available simultaneously on the VOCA tablet. Now, Jenny could request for both. Once she had shown that ability, the intervention focused on ornamental stimuli. Initially, only their pictorial representation was available. Subsequently, such a representation was presented together with those of music and films, and Jenny could request any of the three based on her preference. Once she had shown requests for any of the three stimulus options, the intervention continued with the introduction of the pictorial representation of paintings/images and drawings. The procedure was the same as that described above. Jenny could go through the set of images available and could also color some of the interspersed drawings. Then, this pictorial representation was made available on the VOCA tablet together with the three previously introduced. The same strategy was followed for the last pictorial representation (i.e., make-up). In this case, a request could be followed by the presentation of a mirror and a lipstick or a mirror and a cream. A stimulus/activity condition was made available for about 2 min at each choice occasion.

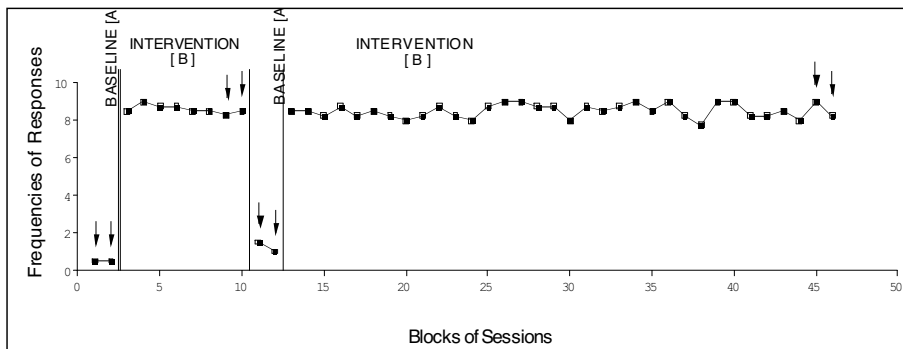
*Intervention (B) phases.* The two intervention (B) phases, which were separated by the second baseline (A) phase, included 29 and 134 sessions, respectively. The VOCA had all five pictorial representations (choice options) on its tablet and Jenny could choose among all of them as at the end of the B<sup>1</sup> phase. A stimulus/activity was available for about 2 min as during the B<sup>1</sup> phase.

### 3. Results

The results of the study are summarized in Figure 1, which shows the mean frequencies of requests per session over blocks of sessions through the baseline (A) and the intervention (B) phases. Blocks include four sessions except when an arrow is present. In that case, they include two or

three sessions. Grouping the sessions allowed a simplified presentation of the data without any apparent loss of information as to the participant's performance over time. The data of the B<sup>1</sup> phase were not reported in the figure, as different conditions were available across the phase (with sessions or part of them involving only one stimulus/activity representation on the VOCA tablet; see above). The data of the baseline phases indicated that only sporadic requests were made (understood) during those periods. The use of small numbers of baseline sessions was based on the view that (a) data changes could hardly occur under those conditions, and (b) a short baseline period would avoid an extension of a presumably frustrating situation. During the B<sup>1</sup> phase, Jenny was showing regular requests, with a mean frequency of about eight per session. During the two intervention (B) phases, Jenny's mean frequency of requests exceeded eight per session. The stimuli/activities more frequently requested were songs, videos, and make-up.

Figure 1 - *The data points represent mean frequencies of requests per session over blocks of four sessions (or blocks of two or three sessions if an arrow is present) during the A and B phases of the study*



#### 4. Discussion

These results indicate that the participant was consistently active making requests and, with marginal caregiver mediation, succeeded in accessing forms of preferred stimuli/activities during the intervention phases. These data provide strong support for the possibility of successful intervention with persons who are rarely provided with such an opportunity and for the possibility of reconciling choice and caregiver mediation in a practicable way (Lancioni, *et al.*, 2007; Sigafos *et al.*, 2009; Rispoli *et al.*, 2010). Indeed,

the caregiver was involved in extending the participant's choice range and allowing the availability of the stimuli/activities, but this involvement was not continuous/massive so as to preclude other commitments.

In light of these findings, three considerations may be in order. First, the number of options available was relatively limited and probably could be extended in line with the characteristics/interests of the participant. Such an extension would pose questions about the new choice alternatives to introduce and the technology to use for that. The basic requirement for the new choice alternatives would be that they are feasible within the participant's situation (i.e., in addition to being interesting for the participant) (Brown, Schalock, & Brown, 2009). The technology could remain the same for the next few alternatives. Afterwards, one could decide whether to adopt a wider device or to divide the options into different groups and allow choice within a single group per session (Light, McNaughton, Weyer, & Karg, 2008; Sigafoos, Schlosser, O'Reilly, & Lancioni, 2011).

Second, some changes could be introduced in the program to make the caregiver mediation somewhat more economical in terms of time (i.e., more reconcilable with his or her regular duties). One way to pursue this goal could be that of extending the amount of time that the participant can deal with the stimulus/activity chosen (e.g., such time could change from about 2 min, as adopted in this study, to 3-4 min or more). Another strategy could be that of involving more staff personnel (and not only a specific caregiver) in the mediation process. In this case, the staff person more easily available could intervene at each of the requests.

Third, one should ensure that the VOCA-assisted choice sessions, which require caregiver mediation, are alternated with microswitch sessions in which the participant is autonomous in seeking environmental stimulation. This combination of sessions could prevent sensory deprivation or understimulation and, at the same time, could keep the time cost for the caregiver (staff) affordable in busy daily contexts (Parsons, Daniels, Porter, & Robertson, 2008).

In conclusion, this study extends the evidence available on the use and effectiveness of VOCA within an area only marginally investigated. New research in this area would be necessary to determine the generality of these findings and provide useful information for possible intervention improvements (Barlow *et al.*, 2009; Lancioni *et al.*, 2009). Research would also need to address (a) the feasibility of the changes suggested above to make the program more practical and affordable in terms of staff/caregiver time investment and (b) the issue of social validation of the reported approach involving caregivers as social raters (Callahan, Henson, & Cowan, 2008).

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# Consequences of Interest-Based Learning on the social-affective behavior of young children with autism

Carol M. Trivette<sup>1</sup> & Carl J. Dunst<sup>2</sup>

## Abstract

*The extent to which variations in the interest-based learning opportunities afforded young children with autism were related to changes in the children's social-affective behavior was the focus of an exploratory study. The participants were 17 children and their mothers. Mothers first identified their children's interests and then selected everyday activities that provided opportunities for engagement in interest-based learning. Based on investigator assessments of the children's participation in the activities, children were divided into high and low interest-based learning opportunity groups. Results showed that after 12 weeks of intervention, the high interest-based group demonstrated more positive and less negative social-affective behavior compared to the low interest-based group. Implications for research and practice are described.*

**Keywords:** Autism, Child interests, Everyday learning, Social and affective behavior

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## 1. Introduction

This brief report includes findings from a pilot study examining the influences of interest-based everyday learning on the social-affective behavior of young children with autism. Children with autism as young as two or three years of age often have problems with social relatedness, including, but not limited to, attenuated positive social behavior (e.g., minimal amounts of social smiling), more than normal negative behavior (e.g., excessive crying or becoming easily upset), and poor interpersonal communication behavior (Barrett, Prior, & Manjiviona, 2004; Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaw, 2004). The consequences of poor social functioning include the inability to initiate interactions with or respond to initiations by adults and other children (Doussard-Roosevelt, Joe, Bazhenova, & Porges, 2003; Warreyn, Roeyers, & De Groot, 2005).

Recent research indicates that the negative consequences of the social behavior associated with autism can be attenuated when the children's interests are made part of either or both informal and formal learning activities. For example, studies by Boyd, Conroy, Mancil, Nakao and Alter (2007), Vismara and Lyons (2007), and others (e.g., Koegel, Dyer, & Bell, 1987; Adams, 2000) have shown that incorporating the interests of children with autism into behavioral interventions has positive consequences and outcomes on different aspects of the children's behavior, including, but not limited to, joint attention, peer interactions, and communicative abilities.

Findings from a line of research on young children's everyday learning in family and community activities (e.g., Dunst, Hamby, Trivette, Raab, & Bruder, 2000; Trivette, Dunst, & Hamby, 2004; Dunst, Bruder, Trivette, & Hamby, 2006) led us to test the hypothesis that the more children participated in interest-based learning activities, the more positive and less negative were the children's social-affective behaviors. Observations of the children in our previous studies, including children with autism, indicated that when the everyday opportunities afforded the children had interest-based features and elements, more positive were the behavioral and developmental consequences. The analyses reported in this paper used both investigators' and parents' ratings of children's social-affective behavior as outcome measures, and differences in the children's interest-based everyday child learning opportunities as the independent variable, to test the hypothesis that higher levels of interest-based learning opportunities would be associated with more positive and less negative children's social-affective behavior.

## 2. Method

### 2.1 Participants

The participants were 13 males and 4 females with autism and their mothers. All of the children had autism as a diagnosis prior to the study, which were made by professionals from highly regarded programs serving children with autism, diagnostic centers specializing in the assessment and treatment of autism, and as part of eligibility determination for preschool special education. The majority ( $N = 14$ ) of children's diagnoses were made using the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1993), while two of the children's diagnoses were made using the Autism Diagnostic Interview-Revised (Rutter, LeCouteur, & Lord, 2003) and one using the Autism Behavior Checklist (Krug, Arick, & Almond, 1980). Most of the children were recruited from the programs and centers where the diagnoses were made, while the rest were recruited from organizations for parents of children with autism.

The children were between 23 and 71 months of age ( $M = 56$ ,  $SD = 12$ ) and had a mean developmental age of 44 months ( $SD = 18$ ). The children's mean developmental quotient was 77 ( $SD = 24$ ). The mothers were between 25 and 47 years of age and had completed 12 to 20 years of formal education. The socio-economic status of the families covered the full spectrum from low to high with most having middle class backgrounds.

### 2.2 Procedure

An investigator-developed protocol employed in previous studies (Dunst, Bruder, Trivette, Hamby, Raab, & McLean, 2001; Dunst, Trivette, & Cutspec, 2007) was used to first interview the mothers to identify the things a child liked to do, enjoyed doing, preferred to do, and the people and events that made a child laugh, smile or vocalize. The protocol included a series of main questions (e.g., "Who are the people who get your child to smile or laugh?" "What are the things that get your child excited?") and follow-up probes to elicit a complete description of a child's interests. The protocol also included a series of main questions and follow-up probes to identify those activities (parenting routines, child routines, play activities, etc.) that constituted a child and family's everyday routines. Each mother was then asked to select 8 to 10 activities that would provide her child learning opportunities everyday or almost everyday that were contexts for interest-based learning.

Every other week for 12 weeks, staff met with the mothers to review what had been done since the previous session and to help each mother plan which activities would be used to provide their child interest-based learning opportunities during the following two weeks. During each session, the mothers were also asked to indicate how often their child participated in different activities during the past week and indicated on a 5-point scale, ranging from *not-at-all* to *always*, how much participation in each ac-

tivity was something the child enjoyed or was interested in doing. The total number of activities that were rated a five on this scale was divided by the total number of activities a child experienced multiplied by 100 to obtain each child's interest-based learning opportunity score. The children were divided into low and high interest-based learning opportunity groups by assigning the children with the lowest interest scores to the low group and assigning the children with the highest interest scores to the high group. The two groups differed significantly in their interest-based learning opportunity scores as evidenced by a significant between group statistical test ( $t = 4.60, df = 15, p < .0004$ ) and a very large Cohen's  $d$  effect size ( $d = 2.23$ ) for the between group differences.

### *2.3 Measures*

Both investigator-administered and parent completed rating scales were used as the outcome measures. The investigator-administered scale assessed both positive and negative child affect, and the parent completed scale assessed child social responsiveness. The scales were each completed on four occasions during the course of the study.

The investigator-administered scale included five positive child affect indicators (smiling, laughter, vocalizations, animated expression, excitement) and five negative child affect indicators (crying, fussing, apprehension, withdraw, avoidance) each rated on a 5-point scale based on observations of children during visits to the families' homes. The children and their parents were observed while they engaged in everyday activities (feeding, dressing, play, etc.) where the children's social-affective behavior manifested during the activity was the focus of the behavioral ratings. The sum of the ratings of the positive and negative behavior indicators were used as dependent measures. Inter-rater agreement was determined for more than one-fourth of the observations and ranged between 87% and 94%.

The parent-completed scale asked the mothers to indicate on a 5-point scale how often their child manifested seven different social behaviors on a typical day (enjoys being around other people, smiles or laughs, easily upset, fusses or cries, intense social engagement, communicative initiation, tries to get others' attention). The scoring of the negative behavior items was reversed to determine each child's social responsiveness score. The sum of the ratings on the seven indicators was used as the dependent measures in the analyses described next. The internal consistency estimates (coefficient alpha) for the scale responses at each assessment were all .88 or higher.

### *2.4 Method of Analysis*

The independent variable was high vs. low interest-based group membership and the dependent variables were the summated scores on the two investigator-rated outcome measures and the one parent completed outcome measure. Linear growth curve analysis (Dixon, 1992) was used to

evaluate the relationship between variations in interest-based learning opportunities and changes in child social-affective behavior. The methodology first calculated a linear growth curve estimate (regression parameter) for each child using their repeated measures data and then evaluated the influence of group membership (low vs. high interest-based) on differences in the slopes of the outcome measures. Three analyses, one for each dependent measure, included a test for linear trends, a test for the average between-group differences, and a test for the interaction between groups and linear trends. The latter was the main focus of analysis.

The three tests were each evaluated by the Z statistic which was used to compute a Cohen's  $d$  effect size (Rosenthal, 1994) for substantive interpretation of the results because of both the small sample size in the study and the now generally accepted practice of using effect sizes rather than statistical significance for interpretation of study results (Thompson, 2001; Valentine & Cooper, 2003). Inasmuch as no prior research has been conducted on the influence of interest-based learning on the social-affective behavior of young children with autism to provide guidance about an expected size of effect, we used Cohen's (1988) guidelines for interpreting the results:  $d = .20$  to  $.45$  is small,  $d = .45$  to  $.75$  is medium, and  $d = .75$  or higher is large (Vacha-Haase & Thompson, 2004).

### 3. Results

The findings are shown in Table 1. The effect sizes for the linear trends were medium to large for the negative child affect and social responsiveness measures, and the effect size for the positive child affect measure was small. In all the analyses, the children demonstrated incrementally more positive and less negative social-affective behavior between Weeks 1 and 12.

The effect sizes for the between group comparisons were medium to large. In all three analyses, the high interest-based group showed more positive affect and more social responsiveness, and displayed less negative affect, compared to the low interest-based group.

The three between-group differences were qualified by group by linear trend interactions as evidenced by the large effect sizes for these tests. The high interest-based group demonstrated incrementally more positive and less negative social-affective behavior between Weeks 1 and 12. In contrast, the low interest-based group demonstrated less positive and more negative social-affective behavior during the same period of time. Additionally, the high interest-based group demonstrated incrementally more social responsiveness over the course of the study, whereas the low interest-based group showed no changes on this outcome measure.

Table 1 - Linear Growth Curve Analysis Results for Changes in the Children's Social-Affective Behavior

	Linear Trend		Between Group Differences		Group X Trend Interaction	
	Z	d	Z	d	Z	d
Child Behavior						
Positive Affect	0.57	0.28	2.02**	1.12	2.01**	1.11
Negative Affect	1.03	0.52	1.81*	0.95	3.09***	2.20
Social Responsiveness	2.49**	1.50	1.36	0.70	1.42	0.72

\* p < .07. \*\* p < .05. \*\*\* p < .01.

### 4. Discussion

Findings showed that child participation in everyday learning activities that was interest-based showed discernable relationships with measures of child social-affective behavior as assessed by research staff and as reported by the children's parents. Whereas previous research has found child factors such as child-preferred activities decrease the social avoidance of children with autism (Koegel *et al.*, 1987), the results presented in the brief report show how children's interests, a development-enhancing child characteristics (Bronfenbrenner, 1992), increases both the positive and decreases the negative social-affective behavior of children with autism. Development-enhancing characteristics are those personal (as well as environmental) factors that can stimulate and sustain interactions with objects and people in a manner that result in environmentally interesting or reinforcing consequences. The findings suggest that incorporating child interests into everyday learning opportunities can positively affect children's social and emotional behavior of young children with autism. It is significant to note that the relationships between children's interests and the child behavior consequences found in our pilot study are very similar to those found in other studies of young children with and without special needs (Raab & Dunst, 2007).

It has been established that the poor social-affective behavior associated with autism interferes with child learning (Koegel & Covert, 1972; Koenig, Rubin, Klin, & Volkmar, 2000) and often negatively influences the behavior of peers and adult caregivers (El-Ghoroury & Romanczyk, 1999; Warreyn *et al.*, 2005). Although children with autism vary considerably in



the severity of and symptoms associated with this disorder, deficits in social-affective functioning are common (Lord & Bishop, 2009). Findings from this pilot study showed that the interest-based everyday learning opportunities afforded children were related to the children's social-affective behavior as expected. That is, the children demonstrated more positive, and less negative social-emotional behavior, from the beginning to the end of the study, when everyday learning opportunities were interest-based.

Despite the positive and encouraging results reported in this brief report, there are nonetheless limitations that need to be mentioned. These include the way in which the independent variables were measured and the types of outcome measures that were used for assessing child social-affective behavior. The aggregate measure of child interests could potentially be problematic because it may have masked variations in the day-to-day differences in children's interest-based everyday learning. The use of behavior observations rather than rating scales for assessing child social-affective behavior would have provided a more direct measure of child behavior. Both limitations are partly offset by findings from other studies where direct measures of child social-affective behavior mapped onto children's interests in a manner similar to that found in this study (e.g., Raab, Dunst, Wilson, & Parkey, 2009).

A next step in this line of research is to investigate the specific characteristics of interest-based child learning that affects child social-affective behavior and how that behavior in turn affects other people. Recent advances in theories of children's interests are available to guide this type of research (e.g., Hidi & Renninger, 2006; Alexander, Johnson, Leibham, & Kelley, 2008). For example, Hidi and Renninger (1992) differentiate between a person's personal interests and those events experienced by a person that are situationally interesting, and postulate how each influences learning opportunities and the consequences of those opportunities. It would therefore be potentially illuminating to compare and contrast the effects of personal and situationally interesting child learning opportunities on social-emotional behavior as well as other outcomes (communication, engagement, joint attention, etc.). In addition to measuring specific features of interest-based child learning, this research would be strengthened if it included direct behavioral measures of outcomes of investigative interest.

The findings have at least several implications for practice. Incorporating interests into both formal and informal learning activities or using interests to select and engage children in interest-based learning activities would seem indicated based on the results reported in this paper as well as elsewhere (Adams, 2000; Boyd *et al.*, 2007; Warreyn, Roeyers, Van Wetswinkel, & De Groote, 2007). Guidelines for these kinds of interest-based learning opportunities can be found in Boyd, Alter, and Conroy (2005), Dunst, Herter, and Shields (2000), and McCormick and Mason

(1986). The interested reader is referred to Raab and Dunst (2007) for a description of the different ways child interests have been measured and used to influence the behavior and development of young children with and without disabilities, including young children with autism.

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# TEACCH-based interventions for families with children with Autism Spectrum Disorders: Outcomes of a parent group training study and a home-based child-parent training single case study

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## Abstract

*Recent guidelines derived from international research literature (Dingfelder & Mandell, 2010) recommend conducting more real-life field studies as a first-step evaluation strategy for bridging the research-to-practice gap in autism intervention. In particular, there is urgent need for more intervention outcome studies for families with Autism Spectrum Disorders (ASD) children in European countries. This paper presents the outcome of two TEACCH-based intervention studies for children with ASD and their parents, carried out in Germany. Both studies aim at examining the effectiveness of TEACCH-based interventions within family settings. The first study, a within-group study, addresses the effectiveness of a three full day, centre-based education and skills parent group training with 23 school-aged children. The second, a descriptive single case study, examines the effectiveness of a medium-intensity TEACCH-based home child-parent program, which additionally included a classroom support component as well as advisory contacts with both health care institutions, and a five-year-old boy over a period of two years. Overall, the outcomes of both studies provide tentative support for the effectiveness and social validity of TEACCH-based interventions in terms of child, parent and teacher outcomes across different settings. For future research into the TEACCH approach, more controlled individual and group research is needed.*

**Keywords:** Family interventions, Autism spectrum disorder, TEACCH approach, Outcome research, Program evaluation

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## 1. Theoretical background of study 1: TEACCH-based parent group training

Parents of children with autism describe the benefits they can receive such as the gratification they gain as they experience the small steps of improvement in their child's developmental progress or the discovery that through this experience the parents can derive greater meaning from their lives (Marcus, Kuncze, & Schopler, 2005), and not all of these children need professional help. However, there is much evidence from empirical studies that a great number of these parents do face challenges and stress that, on average, accumulates at an intense level (Sanders & Morgan, 1997). The generalized "Double ABCX model" of caregiver coping (Probst, Jung, Micheel, & Glen, 2010; adapted from McCubbin & Patterson, 1982 and Pakenham, Samios, & Sofronoff, 2005) has also proven to be valid in planning and delivering adequate professional support to ASD families (Pakenham *et al.*, 2005). For this model, there is broad evidence from empirical studies that parent training through education and skills interventions contributes to the following: (1) the enhancement of parents' psychological resources, primarily by strengthening the "sense of personal efficacy" (cf. Bandura, 1997) and the "sense of coherence" (Antonovsky, 1979), which refers to the parents' trusting in their own and significant others' abilities for managing the given challenging situations, and experiencing an understandable and meaningful world; (2) the enhancement of social resources, for instance, by learning from other parents how to use community supports; (3) the enhancement of behavioural coping skills, specifically by acquiring parenting strategies and skills; (4) the strengthening of adaptive emotional coping abilities when discussing emotional experiences regarding the child with other parents, possibly resulting in the reappraisal of stress and demands; (5) the enhancement of family adaptive functioning, in terms of reduced parent stress, strengthened parent health, and improved parent-child relationships (Marcus *et al.*, 2005).

Matson, Mahan and Matson (2009), addressing the effectiveness of parent training programs in their narrative review, have summarized that behavioural parent training programs have proven to be an effective, evidence-based methodological approach. Singer, Ethridge and Aldana (2007) come to a similar overall conclusion in their meta-analysis.

The TEACCH approach, emphasizing (a) "structured teaching" based on visual cues (Schopler, 1997), (b) broad-spectrum cognitive-behavioural strategies and (c) close professional-parent cooperation (Schopler, 1997), was selected as a framework for designing the present parent group training program because of its best-practice characteristics discussed in detail in Probst *et al.* (2010) (see also Francis, 2005).

In German-speaking countries, there are a few descriptive and informal studies on the TEACCH approach with children and their families that sug-

gest both the effectiveness and practicability of this method (e.g., Czerwenka, 2008). However, there is a total absence of formal evaluative studies in international journals on the efficacy, effectiveness and social acceptance of TEACCH-based parent training in Germany.

## 2. Aims of study 1

The present observational within-group study aimed at examining the parent-reported implementation quality, effectiveness and social acceptance of a centre-based education and skills group training program for parents of children with ASD. The hypotheses to be tested include the following: (1) Do parents evaluate the implementation of the group training positively in terms of overall quality, trainer behavior, group atmosphere and manual quality at the end of the group training? (2) Do parents report positive effects of the group training on parenting skills for enhancing the child's educational and behavioural functioning, parental health family's emotional setting at home and transfer onto the child's support system at the three-month follow-up? Specifically, do parents report positive effects of the core training contents on everyday life including: "education in a science-based autism" concept "training in structured teaching strategies", and "participating in communications based on the parent-as-teacher-to-parent" concept (Schopler, 1997) at the three-month follow-up? (3) Do parents report some implementation of structured teaching methods taught in the group training in everyday life at the three-month follow-up?

## 3. Method of study 1

### 3.1 *Participants*

A total of 24 parents (83% mothers, 17% fathers, mean age = 39.4,  $SD = 9.2$ ) of 23 autistic children (61% male, mean age = 8.9,  $SD = 3.6$ ) with medically verified diagnoses of childhood autism ( $n = 22$ ) and atypical autism ( $n = 1$ ), and 96% of them attending special preschools and normal schools participated in the parent training in three small groups in three German towns. The sample of parents was recruited with the support of the German Autism Parent Association and its treatment centres, and related welfare services based on the Red Cross and the German Evangelical Church welfare organization, and was organized through a process of voluntary self-selection.

The pre-intervention assessment included a 48-item Parent Stress Reaction to Child's Behavioural Symptoms Questionnaire (adapted from Stone & Hogan, 1993). The five behavioural symptoms that were associated with the strongest parental stress reactions are reported in Table 1.

Table 1 - *Results from the parents' Stress Reactions to Child's Behavioural Symptoms Questionnaire*

Items showing highest stress reactions in parents	2 = moderate stress (%)	3 = high stress (%)
My child lives in its own world, which is difficult for others to reach	17	61
My child prefers to play alone than with other children	35	40
My child has tantrums	22	56
My child is quickly disappointed if unable to express him- or herself	32	42
My child does not do as her or she is told and does not accept rules and respect limits	16	53

Note: Responses scoring on a 3-point Likert scale with 1 = this behaviour causes me no or little stress, 2 = causes moderate stress, 3 = causes high stress.

The results in Table 1 indicate that autism-specific behaviours (items 1, 2, 4) as well as unspecific behaviours (items 3 and 5) are stressful challenges for the large majority of parents.

### 3.2 Intervention

*Curriculum:* The key curriculum components of the parent training comprise (1) teaching a state-of-the-art concept of autism including causes, nature, life-long consequences of this developmental disability, as well as treatment goals and methods, (2) enhancing parent emotional and cognitive coping abilities by exchanging experiences with other parents about development and behaviours of one's child and sensitizing them to family issues resulting from ASD, and (3) teaching strategies and skills for enhancing the child's development and behaviour management, focusing on the elements of *Structured Teaching* (Schopler, 1997; Probst *et al.*, 2010) including (a) methods of visually structuring the child's environment and establishing behavioural routines, (b) additional antecedent and consequence-based structuring methods, (c) methods of enhancing child's functional communication, pre-academic skills, play skills, daily life routines and self-management skills through the combined use of structuring methodology. The parent training manual which was delivered to parents was structured according to the three goal domains described above and divided into three main parts (Probst, Brakemeier, Faecks, Gewohn, & Jung, 2008).

### 3.3 Measures

(a) The implementation of the training was assessed at each of the three training sessions by the *Parental Evaluation of Training Sessions Questionnaire*.



naire, a Likert-type 9-item parent questionnaire covering “therapist behaviour”, “emotional group atmosphere” and “overall assessment” on 4-point scales (e.g., “Looking at this Saturday’s session, how satisfied were you with this session overall?” 1 = *satisfied*, 2 = *rather satisfied*, 3 = *rather unsatisfied*, 4 = *unsatisfied*). The questionnaire was completed by all 24 parents.

(b) The effects of the training program on daily family life were assessed at a three month follow-up after completion of the three training sessions (83% return rate) by the 26-item Likert scale *Parental Evaluation of Training Effects on Daily Family Life Questionnaire* (adapted from Mattejat & Remschmidt, 1998) covering aspects of “parenting behaviours”, “parent health”, and “family climate” (e.g., “The parent training has helped me to better control my child’s behavioural problems”, 1 = *I don’t agree*, 2 = *I moderately agree*, 3 = *I strongly agree*). The items assess the change in daily family life and thus can be considered as an implicit and retrospective pre-post assessment.

For the current presentation a representative selection of related items in terms of psychological-educational content were subsumed under the following seven categories (see also Figure 2):

(1) *Improved parental skills* [averaged across items numbered 1, 2 and 3 in Table 9, Probst & Leppert, 2007: (1) “Overall, the parent training has been effective in improving the daily management of my child”; (2) “Parent training has meant that I can better enhance my child’s abilities than before”; (3) “Parent training has helped me to better control my child’s behavioral problems”];

(2) *Improved parental health* [averaged across items 4 and 7, ibd.: (4) “Parent training has had a positive influence on me both physically and psychologically”; (7) “Parent training has lead to a reduction in daily demands and stress”];

(3) *Improved family climate* [item 5, ibd.: “Parent training has had a positive effect on our family atmosphere”];

(4) *Autism concept teaching helpful* [averaged across items 12, 13, 14, 15, ibd.: (12) “Studying the nature of autism was helpful and useful for me and had a positive effect on my everyday behavior”; (13) Studying causes of autism (...); (14) “Studying concepts and treatment goals in rehabilitation of autism was helpful (...); (15) “Group discussion (...) on the sensitization for greater sensitivity to family issues and sibling problems was helpful (...);

(5) *Practical training helpful* [item 16, ibd.: “Practical exercises in parent training on how to organize everyday life (...) were helpful and effective and had an influence on my everyday behavior”];

(6) *Parents as teachers to parents” helpful*: [averaged across items 10 and 11, ibd.: (10) “The other parents (...) were important “teachers for me”; (11) “The exchange of experiences with other parents was helpful and had a positive effect on my everyday behavior”].

(7) *Transfer to child support team* [item 9, ibd.: “I was able to pass on ideas from the parent training to other members of my child’s support team (teachers etc.)”].

(c) The outcome of the training was also assessed by a semi-structured 8-item *Home Diary Experience Questionnaire*. Parents were asked to report on the implementation of *Structured Teaching* methods that had been taught in the parent group training in everyday life. The eight items referred to “physical organization”, “schedules”, “work and learning systems”, “task organization”, “behavioural prompts”, “behaviour shaping”, “consequence-based methods”, and “language, communication and social skills enhancement methods” (cf. Probst *et al.*, 2010). This questionnaire was completed by 16 parents at the three month follow-up, which is a return rate of 65%. The contents of the questionnaire were scored on a 2-point rating scale with 1, if parents reported the implementation of at least one *Structured Teaching* method over four or more weeks in a comprehensible and detailed manner, otherwise with 0.

### 3.4 Procedure

The group training programs were conducted in small groups in three German towns in rooms belonging to the local autism health care centres. The training comprised three sessions, one per month, lasting a full day each. The three small groups contained 12, 8 and 3 parents, respectively. The teaching methods used included video and in vivo modelling, group discussion, and assignment of homework. The trainings were performed by two professionals, the first author (P. P., licensed clinical psychologist) and a master-level psychologist, both trained in TEACCH and related methods of contemporary ABA. All parents participating in the group training utilized the local autism health care centres. The therapists who performed the parent trainings routinely exchanged information about course and contents of the training with the staff of the local autism centres at regular intervals.

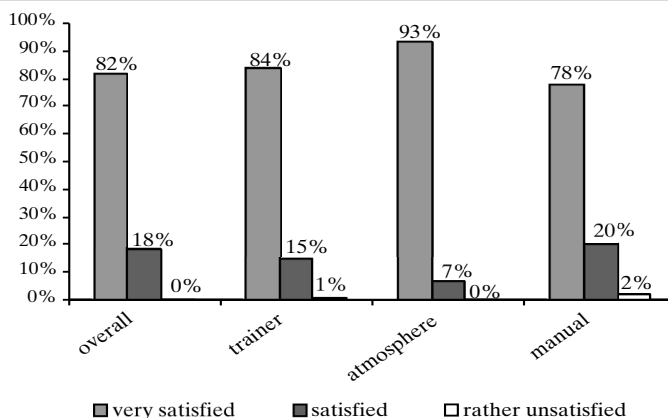
### 3.5 Data analysis

Quantitative questionnaire data were analyzed with SPSS (version 15). Qualitative verbal data were analyzed by using summarizing and categorizing techniques of “Qualitative Content Analysis” methodology described by Mayring (2000).

## 4. Results of study 1

(1) *Parental Evaluation of Group Training Implementation Questionnaire*: The results, summarized in Figure 1, show that the training implementation was evaluated positively regarding overall quality, trainer quality, group atmosphere, and parent manual quality by almost all parents.

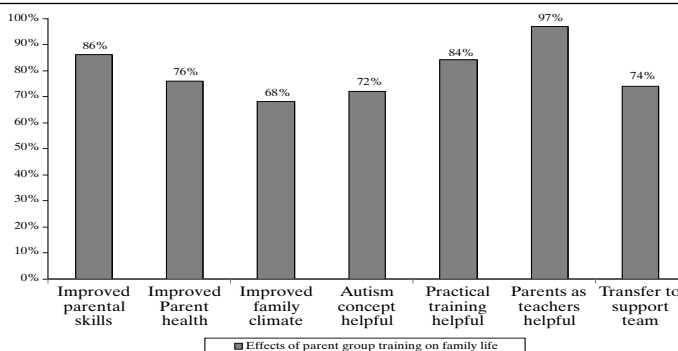
Figure 1 - Results of the parent's evaluation of the training implementation Questionnaire



Note: The y-coordinate describes the percentage of evaluative parent responses (averaged across 3 sessions); the x-coordinate includes the evaluative categories.

(2) *Parental Evaluation of Training Effects on Daily Family Life Questionnaire*: The parents' evaluation of the training effects on daily family life three months after the completion of the training is presented in Figure 2. It shows that the vast majority of about 70 to 90 percent of parents evaluated the training outcomes positively. They reported beneficial effects on parental skills, parent health, and family atmosphere. In addition, both components of the group training, autism concept education and practical skills training were evaluated as helpful and effective. Finally, some positive transfer of concepts taught in the group training to members of the child's report team was reported.

Figure 2 - Results of the follow-up "Parent Evaluation of Training Effects on Daily Family Life Questionnaire"



Note: The y-coordinate describes the percentage of parents evaluating the effects of the parent group training as "moderately" or "strongly positive" (with scores of 2 or 3 on the 3-point Likert scale); the x-coordinate includes seven categories of reported effects on daily family life (see also section 2.3 above).

(3) *Home Diary Experience Questionnaire*: The protocols from this instrument contained a detailed description on how the methods presented in the trainings, such as “implementation of daily schedules”, were put into practice. 12 of 16 responding parents reported one or more implementations of structured teaching methods in everyday life. The most frequently reported methods included “schedules”, “physical organization” and “task organization”. Overall, there was a high consistency between the answers in the Follow-up questionnaire and the reports in the Home Diary Experience Questionnaire.

## 5. Conclusions of study 1

In the current study, the effectiveness and social validity (Foster & Mash, 1999) of a TEACCH-based education and skills group training for parents of children with autism were evaluated.

Overall, both child- and parent-related positive effects of the group training on “real family life” at a 3-month follow-up were reported by the large majority of about 70-90 percent of parents. These results of the first formal TEACCH-based parent group intervention evaluation in the German sociocultural setting suggest an implicit pre-post effect of the training and are consistent with those of evaluation studies on autism group parent trainings from Bernard-Opitz and Kok (1992), Harris (1986), Schopler, Mesibov, and Baker (1982), and Panerai, Zingale, Trubia, Finocchiaro, Zuccarello, Ferri and Elia (2009). Further, the findings are congruent with those of a TEACCH-based teacher group training study, conducted in German special schools for children with intellectual and developmental disabilities, showing positive effects on pupil symptom behaviours, teacher-pupil interaction behaviours, classroom atmosphere, and teacher health and stress levels (Probst & Leppert, 2007, 2008).

Regarding social validity, the result of the overall positive acceptance of the concept, method and effect of the training program by parents is consistent with a large-scale study by Schopler *et al.* (1982) conducted in the USA suggesting that a significant percentage of parents are adequately motivated to participate in parent education and training, and to assume facilitator roles.

However, in the interpretation of the results, limitations to the “experimental validity” (comprising *internal* as well as *external* validity) must be taken into consideration.

The internal validity is constrained by the absence of a control group and formal pre-assessment measurement, and also by the limited range of the outcome measures focusing on parental reports. The external validity is limited because the study was carried out on a convenience sample, which was comprised of self-selected, voluntary participants.

In spite of these methodological limitations, which are common to real-life evaluative pilot studies, this study provides some evidence that a low-intensity and low-cost intervention as shown in the present group parent program meets some needs and capacities within the current health care setting in Germany, in particular, when considering the situation that many autism treatment centres currently fail to provide group parent training or related family interventions as standard operating procedures.

The group training could be provided as a middle-level intervention within a graded multiple-level family intervention continuum reaching from low-level parent interventions including low-threshold contacts to high level interventions including individually provided comprehensive parent and family support (cf. Schopler, 1997; Sanders, Mazzuchelli, & Studman, 2004).

## 6. Theoretical background of study 2:

### Outcomes of a home-based child-parent intervention

A significant number of parents of children with Autism Spectrum Disorders and related disabilities need individualized in-home intervention with professionals modelling parenting skills, giving feedback and individual directions to parents, and advocating parent interests in school and other community fields. Home programming is considered a cornerstone of the TEACCH program, where parents are supported to serve as their child's "co-therapist" as informed and skilled parents (Ozonoff & Catheart, 1998). The therapist's role is characterized by (a) a "generalist" orientation, that means avoiding too much concentration on single aspects, forcing professionals to see children the way their parents do, and *not* unduly influenced by narrow parameters governing their professional disciplines (Mesibov, 1994), and (b) a "holistic" approach, which means over-all attention to the person as a "whole" entity rather than fragmenting the individual into arbitrary categories such as speech, behavior, and social skills (cf. Mesibov, 1994; Schopler, 1997). Conceptual and procedural transfers from home intervention to classroom are of paramount importance for the child (cf. Marcus *et al.*, 2005).

## 7. Aims of the study 2

The present descriptive multiple-level single subject study with a 5-year old child (M) with child autism aimed at examining the effects of a TEACCH-based home programming intervention on child, parent, teacher, and health professional outcomes. The child-related hypotheses to be tested included improvements in (1) task behaviour, (2) language and

communication skills, (3) play skills, (4) pre-academic and self-management skills, (5) developmental functioning in family, and (6) developmental functioning in the classroom. The parent-related hypotheses to be tested included improvements in (1) implementation of structured teaching in the family, (2) acquisition of an individualized concept of autism and (3) overall positive program acceptance. The teacher-related hypotheses to be examined comprised (1) the enhancement of implementation of structured teaching in the classroom and (2) acquisition of an individualized concept of autism. Finally, the health professional-related hypothesis addressed the provision of formal social support for parents and classroom teachers.

## 8. Method of study 2

### 8.1 Participants

The subject of the home programming was a boy (M), aged 5, with a medically confirmed diagnosis of child autism (WHO, 1992: ICD-10). M was living with his parents and his typically developed 1 year-old sister in Hamburg, Germany. M's mother and main caregiver, aged 25 was of German origin, M's father, aged 29 was Russian. M was referred to the ASD research unit (Department of Psychology, University of Hamburg) by the community mental health service due to severe behaviour problems in preschool, in particular physical aggression against other children, temper tantrums and lack of compliance. The present in-home training, extending over a period of 22 months, was performed by the first author (P. P.). The intervention was partly funded by the parents' health insurance company. The *diagnostic assessment* of M at the beginning of the intervention included (a) autism symptoms, (b) language functioning, (c) cognitive functioning, and (d) social functioning.

(a) *Autism symptoms*: In the Autistic Diagnostic Interview-Revised (ADI-R, Lord *et al.*, 1994; Bölte, Rühl, Schmötzer, & Poustka, 2006), M scored above the autism cut-off on all four scales: social interaction = 27 [cut off = 10], communication = 14 [cut off = 7], stereotypes = 5 [cutoff = 3], and abnormal early development = 5 [cut off = 1].

(b) *Language functioning*: Information from different sources including the Munich Functional Developmental Scales (Ernst, 2010), mother-reported qualitative information from ADI-R, preschool teacher report, and in-home therapist behavioural observation, consistently indicated severe deficits in the verbal domain, both in expressive and receptive language functioning, with developmental ages of 13 and 18 months, respectively. His percentile score of 2 in the Peabody Picture Vocabulary Test (Dunn & Dunn, as cited in Bondy, Cohen, Eggert, & Lürer, 1992) based on a reference group of children with intellectual disabilities, was congruent with these findings.

M was raised bilingually (German and Russian). No use of spoken language was observed at age 5; 6. There was no naming, no functional verbal communication and only sporadically immediate echolalia of syllables or single words. Vocal expressions including song-like, mostly high-pitch, sequences of sounds were observed frequently, for example when playing with puzzles.

(c) *Cognitive functioning*: M's percentile score of 99 in Raven's Coloured and Progressive Matrices (Raven, as cited in Bondy *et al.*, 1992) and his percentile score of 62 in the Columbia Mental Maturity Scale (Burgemeister, Blume, & Lorge, as cited in Bondy *et al.*, 1992) based on an intellectual disability norm group, indicated a comparatively higher ability in visual-spatial reasoning.

(d) *Social Functioning*: His social developmental age of 18 months in the Munich Functional Developmental Scales indicated severe deficits in social functioning, as is indicated consistently by the ADI-R and teacher reports.

## 8.2 Goals, conceptual framework and intervention methods

*Intervention goals*: The goals for M comprised four domains (1) *child-centred* goals of enhancing M's (a) language and functional communication skills, (b) pre-academic and play skills, (c) social and emotional functioning in family, preschool and primary school; (2) *parent-centred* goals of (a) enhancing structured teaching skills (focusing on mother, the main care-giver), and (b) establishing an adequate individualized autism disability concept; (3) *teacher-centred* goals (a) of enhancing M's inclusive classroom adaptation, which included supporting his transition from preschool to primary school and later from primary to secondary school, and (b) establishing an appropriate individualized autism concept for him; and (4) health-professional-related goals of providing formal social supports for M in family and classroom.

*Conceptual framework*: Overall, the in-home intervention program was conceptually based on methods of Structured Teaching and the principle of establishing excellent professional-parent cooperation and considering parents as powerful agents for promoting and managing their child (Probst *et al.*, 2010).

*Methods of intervention*: The overall intervention comprised child, parent, teacher-related and health professional-related methods.

(a) The *child-related* intervention methods included (1) *Visually Structuring* M's home environment, for example by providing a clearly designed workplace area, and a picture schedule indicating the sequence of events during the home session, (2) *Vocal Imitation Language Training* (conducted during months 5 to 7 of intervention), in which the child was supposed to repeat simple vocal expressions (vowels, syllables, single words) presented by therapist or mother, (3) *Object Naming Language Training* (months 9-10), in which the child was supposed to name daily life objects, such as "dog" or "ball" presented on pictured cards by the therapist or mother (4) *Functional Communica-*

*tion Training* (months 11 to 20), in which the child was taught to use nonverbal and verbal functional communication spontaneously. For example, M was taught to use pictorial “request cards” containing a pictured glass of juice or pictured crackers for requesting a drink or crackers; later he was taught to replace the request cards by the verbal expressions of “want drink” or “want crackers”, (5) *Play Skills Training* including closed-ended functional play (e.g., puzzles, form boards, sorting and assembling tasks), open-ended functional play (e.g., playing a rhythm instrument), closed-ended cooperative play (e.g., animal picture Lotto, Memory, card games), symbolic play (e.g., watching a picture book and commenting, playing and talking with a toy animals; for taxonomy, see Quill, 2000), (6) *Pre-Academic and Self-Management Skills Training* including categorical and numerical matching, and copying tasks conducted within the context of visually cued routines of Work and Learning Systems (see Probst *et al.*, 2010, Table 1).

The training elements (2) to (6) were based on *Structured Teaching* methods of visually cueing, physical, gestural, and verbal prompting, instruction, behavioural shaping and material and social reinforcement (mostly by small snacks, applause and praise).

(b) The *parent-related* intervention methods included (1) “Parent Education” regarding an adequate concept of autism, individualized for M, by providing information and discussion, (2) “Parent Teaching” about how to design and implement methods of Structured Teaching, including instruction, discussion, assigning home-work and giving feedback, (3) “Parent Teaching” on how to carry out Skills Trainings such as Vocal Imitation Language Training, Object Naming Language Training, and Functional Communication Training, including using instructions, modelling assigning homework, and giving feedback, as well as homework comprising conducting and documenting training activities, whereby parents were asked to do exercises with the child for a maximum of 10 minutes per day, three to five days per week, and finally (4) “Broad-Spectrum Parent Counselling” and support during in-home sessions, based on the principles of client-centred listening and responding.

(c) The *teacher-related* interventions comprised (1) school visits with participation in classroom activities and teacher conferences, and (2) information by providing printed and video materials on autism issues.

(d) The *health professional-related* interventions based on contacts with a paediatrician, a health insurance authority, social security office, and school board, including (1) authoring reports from experts on M, (2) participation in conferences, and (3) information exchange via written and phone correspondence.

### 8.3 Measures

The instruments used for program evaluation measured child-, parent-, and teacher-related outcomes are summarized in Table 2.



Table 2(a) - Home programming pre/post outcome measurement instruments

Measures
<i>Child-related measures</i>
(1) <i>On-task and Vocal Stereotypic Behaviours Observations</i> : Behavioural samples were drawn from video recordings of in-home sessions during the first (Pre) and last third (Post) of the intervention. The child's behaviours observed during typical play and preacademic activities included (a) off-task behaviour including inattentive and restless behaviours such as fidgeting, leaving one's place, and gaze aversion, and (b) vocal stereotypes, which mostly had the form of sing-song-like vocalizing. Percentage scores were calculated for both behavioural categories from the number of intervals in which the target behaviour occurred, divided by the total number of observational intervals.
(2) <i>Vocal Repeating Language Skills Inventory</i> including 25 items including vowels and syllables, such as "a", "mu", "bebe", "ola", "mama", "bepo". All items were presented orally by therapist or mother in each trial. Scoring was 1 = <i>correct repeating</i> , 0 = <i>incorrect or no repeating</i> . A sum score was calculated. This inventory was completed at Pre (at month 3 of the in-home intervention = <i>beginning of the vocal training</i> ) and Post (at month 7 = <i>end of the vocal training</i> ).
(3) <i>Object Naming Language Skills Inventory</i> including 33 items of daily life objects, such as car, ball, ship, and knife, corresponding to 33 picture cards including these objects. Scoring was 1 = <i>correct response</i> , 0 = <i>incorrect or no response</i> . A sum score was calculated. This inventory was completed at Pre (at month 9 = <i>beginning of the naming training</i> ) and Post (at month 11 = <i>end of the naming training</i> ).
(4) <i>Spontaneous Functional Communication Skills Inventory</i> including 9 items reflecting categories of functional communication (adapted from Watson, Lord, Schaffer & Schopler, 1989) such as "Requesting", "Getting attention", "Rejecting", "Giving information", "Commenting", "Seeking information", "Greeting", "Saying Hello", "Thanking". Each item was scored by therapist on a 2-point rating scale with 1 if the communicational modality was reported by parents and observed by therapist, otherwise 0. A sum score was calculated. This inventory was completed at Pre (at month 12 = <i>beginning of the communication training</i> ) and Post (at month 22 = <i>end of the communication training</i> ).
(5) <i>Child-related Qualitative Verbal Information Collection</i> was based on (a) mother diary reports; (b) therapist in-home session logs taken from session notes, memory minutes, and video records, (c) therapist notes based on phone and letter correspondence with parents and teachers, and (d) teacher reports including information about M's behaviours within the family and the classroom. Child-related qualitative data were collected during all intervention activities.
<i>Parent-related measures</i>
(1) <i>Implementation of Structured Teaching Strategies in Everyday Family Life Inventory</i> including 11 items (adapted from Schopler, Mesibov, & Hearsey, 1995; Bregman, Zager, & Gerdtz, 2005), reflecting five "Visually Structuring" methods and six "Further Components of Structured Teaching" (cf. Probst et al., 2010, Table 1). Each item was scored by therapist on a 2-point rating scale with 1 if parents reported implementation of a strategy over more than 4 weeks and the therapist observed the implementation in life-situations or from parent video records. A sum score was calculated. This inventory was completed at Pre (at month 1 = <i>beginning of home-based training</i> ) and Post (at month 22 = <i>end of the home-base training</i> ).
(2) <i>Parent Concept of Autism Quality Inventory</i> included the 5 items (1) Knowledge about defining symptoms of autism and insight into specific deficits and strengths of M, (2) adequate knowledge of causes and consequences of autism, (3) adequate self-efficacy and control beliefs regarding behavioural management and development enhancing in M and gaining social support for M, (4) insight into specific needs of M relating to family and school life, and (5) realistic cognitions on future development and psychosocial prognosis of M. Each item was scored by the therapist on a 2-point rating scale with 1 if oral discussions or written parent reports reliably indicated advanced knowledge and insight on the current topic, otherwise 0. A sum score was calculated. This inventory was completed at Pre (at month 1 = <i>beginning of the home-training</i> ) and Post (at month 22 = <i>end of the home-training</i> ).
(3) <i>Parent-related Qualitative Verbal Information Collection</i> was based on therapist session notes and therapist-parent correspondence. It included information on parent experiences and behaviours. Parent-related qualitative data was collected during the whole course of intervention.
(4) <i>Parent Treatment Evaluation Questionnaire</i> (adapted from Matthejat & Reimschmidt, 1998). The questionnaire contained 21 Likert items on a 5-point scale, for example "The treatment was helpful for my child" (from 0 = <i>I disagree strongly</i> to 4 = <i>I agree strongly</i> ), from which two scales were derived: "Perceived Effectiveness of the Program" and "Perceived Parent-Professional Relationship Quality". This questionnaire was completed by mother at Post-occasion (after month 22 = <i>end of the home-training</i> ).

Table 2(b) - *Home programming pre/post outcome measurement instruments*

Measures
<i>Teacher-related measures</i>
(1) <i>Teacher Implementation of Structured Teaching Strategies in Classroom Life Inventory</i> was structured similarly to the corresponding parent instrument described above. Each item was scored with 1 if teachers reported implementation of a strategy over more than 4 weeks and the therapist observed the implementation in classroom life-situations. A sum score was calculated. This inventory was completed at Pre (at month 18 = beginning of primary school contacts) and Post (after month 22 = end of the home-based training).
(2) <i>Teacher Concept of Autism Quality Inventory</i> included the 3 items (1) State-of-the-art knowledge of causes, nature, and educational consequences of autism, (2) insight into specific deficits, strengths, needs, and psychosocial prognosis of M, and (3) high self-efficacy and control beliefs regarding education and behavioural management of M. Each item was scored by therapist on a 2-point rating scale with 1 if the item could be confirmed positively on the basis of therapist notes relating to therapist-teacher interactions, otherwise 0. A sum score was calculated. This inventory was completed at Pre-occasion (at month 18 = beginning of primary school contacts) and Post-occasion (after month 22 = end of the school contacts).
(3) <i>Teacher-related Qualitative Verbal Information Collection</i> was based on therapist notes and therapist-teacher correspondence. It included information on teacher experiences and behaviours in the classroom. Teacher-related qualitative data was collected from all classroom and school contacts.
<i>Health professional-related measures</i>
Health professional-related <i>Qualitative Verbal Information Collection</i> comprising therapist-health professional correspondence, therapist notes, parent reports on health professional contacts, and therapist expert reports.

*Follow-up measures:* The measures used at Follow-up 1 (M aged 15;8) included (a) Autism Diagnostic Observation Schedule (ADOS, Lord *et al.* 2001; Rühl *et al.* 2004), (b) Wechsler Intelligence Test for Children (WISC-IV) (German form: HAWIK-IV, Petermann & Petermann, 2008) and (c) qualitative verbal information based on therapist-parent contacts. The measures used at Follow-up 2 (M aged 17;5) included (a) qualitative verbal information based on informal interview and mail correspondence with mother, and (b) school reports.

#### 8.4 Procedure

Each in-home session lasted 3 hours on average, and was subdivided into 2 sections. In section 1 (2 to 2.5 hours including breaks), the therapist in the main part interacted with the child doing developmental assessment tasks, play skills training, language training, pre-academic skills training and related activities, while his mother observed the activities in the background. In section 2, the therapist focused on parents (mostly the mother) by discussing broad-spectrum child, family and school issues, giving feedback on homework, and giving instructions for parental behaviours, while M was doing activities alone such as watching videos or doing puzzles.

Interventions with teachers and related professionals focused on providing information on causes, nature, and educational consequences (in particular Structured Teaching) of autism, and discussing developmental,

educational and social issues relating to M and his family. Classroom visits lasted 3 to 5 hours.

The sum of intervention activities over 22 months amounted to about 100 hours, including (a) 20 in-home parent-child assessment and intervention sessions, 3 hours per session (60 h), (b) broad-spectrum parent counselling by phone and written communication (10 h), (c) interactions with M's classroom teachers via classroom visiting contacts and mail correspondence (15 h), and (d) interactions with health care professionals (15 h).

**Aftercare and follow-up activities:** After the termination of the 22-month home programming intervention (M aged 7;4) contacts between therapist, and parents, teachers and health professionals, were maintained and took place sporadically, predominantly "on demand" from parents, such as in supporting the transition from primary to secondary school (M aged 11;0), providing reports from experts for determining the "level of care" for M (M aged 16;6), utilizing expert opinion to influence the family's decision to move to a larger apartment with separate rooms for M and his younger sister (M aged 16;10), and also to support M's transition from secondary school to a sheltered vocational facility (M aged 17;6). The formal follow-up assessment at age 15 took place at the ASD unit at the University of Hamburg. The informal assessment at age 17 was conducted via phone and email correspondence between therapist and mother.

### 8.5 Data analysis

For the data analysis of video-based child behavioural observation, "one-zero sampling" (Martin & Bateson, 2007) was used, in which an observational interval is scored if a defined behaviour occurs at any point during a specified time interval (15-seconds). Qualitative verbal data was analyzed using methods of categorizing and summarizing described by Mayring (2000).

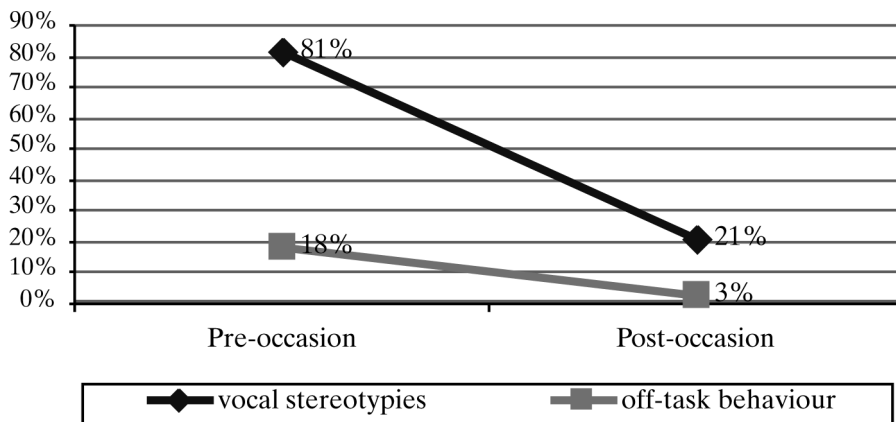
## 9. Results of study 2

### 9.1 Child outcomes

In the following, the results of child outcomes for the 22-month home program intervention are summarized.

(1) *On-task behaviour:* The systematic behavioural observation showed that M's frequency of stereotyped vocalizations during play and pre-academic activities decreased from an initial high level of about 80% during the first third of the home intervention sessions to about 20% during the last third of intervention. Similarly, off-task behaviours clearly decreased. (see Figure 3).

Figure 3 - *Outcomes of on-task and stereotyped behaviour observations during therapy session*



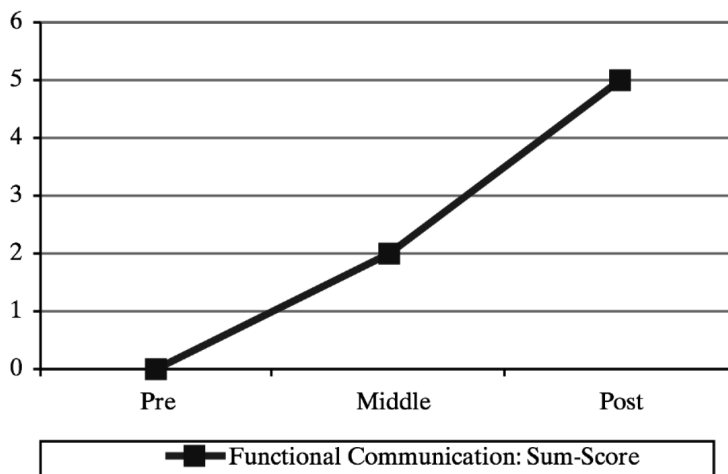
Note: The y-coordinate represents the percentage of intervals in which the specified behaviours of “vocal stereotypies” and “off-task behaviour” occurred at “Pre-occasion” and “Post-occasion”.

## (2) Language and Communications Skills:

(2a) *Vocal Repeating Skills Inventory*: Results indicated improved skills with an increase from 4% percent of correct responses (sum score = 1) at Pre to 100% (sum score = 25) at Post (the end of the vocal training), with a transfer of prompting from therapist to mother.

(2b) *Object Naming Skills Inventory*: Results indicated improved skills with an increase from 0% (sum score = 0) at Pre to 100% (sum score = 33) at Post (the end of the naming training), with a transfer of presenting the cards from therapist to mother.

(2c) *Spontaneous Functional Communication Skills Inventory*: At Pre no functional language communication was observed (sum score = 0). In the course of the communication training, M began using spontaneous functional nonverbal communication, at first with holding up his pictured “I want salt crackers-card” for requesting; later, he increasingly used functional verbal communication. At the end of this period, M spontaneously and reliably used the following five verbal communication categories (a) “Requesting”, e.g., “want apple” or “want Simba” (the Lion King video, expressed first in Russian, then in German), “I like better”, (b) “Rejecting/ Refusing” (“No!”, “Stop it”); (c) “Saying hello”, (d) “Saying good bye”, and (e) “Saying thanks”. At the Post the sum score = 5 (Figure 4), M also generalized these skills to preschool classroom. These findings are confirmed by therapist notes, parent diaries, and preschool teacher reports.

Figure 4 - *Outcomes of the Functional Communication Training*

Note: The y-coordinate represents the sum score of functional communication categories used by M; the x-coordinate represents the occasions of "Pre", "Middle" and "Post" assessments for the communication training (cf. Table 2).

(3) *Play skills*: Evidence of M's expanded play skills from functional play alone (e.g., puzzle) to cooperative/ social play (e.g., playing animal memory game with therapist or parents) and elementary symbolic play (e.g., using animal toys) is extensively shown in both informal therapist and parent reports.

(4) *Pre-academic skills and self-management competencies*: Evidence for increased pre-academic skills in copying, sorting, numbering, matching, numerically and semantically categorizing, and managing skills was broadly found in informal therapist and parent reports. For example, M was able to do pre-academic tasks (e.g., copying, semantic-categorical matching) independently and alone on his work-place for 30 to 60 minutes, following a pictorial four element "Work and Learning System" informing the child of what is expected of him in work activities (cf. Probst *et al.*, 2010, Table 1, p. 144).

(5) *Developmental functioning in the family*: According to parent reports (M aged 6;7 to 6;9) M showed improved compliance with verbal directions, increased social play with the younger sister (e.g., hide and seek), use of reconciliation gestures, seeking and accepting consolation when in pain, attempts to draw attention to objects and events that interested him by using a pointing gesture, increasing tendencies to sleep in his bed alone instead of coming to parents during the night; increased independence at the playground.

(6) *Developmental functioning in classroom*: According to (1) inclusive preschool teacher reports (M aged 6;7-6;11) M took part in group activities and played with other children more often, and showed less aggressiveness. (2) Classroom visit notes and primary school teacher reports (M aged 7;

0-7;6) suggested that M (a) sought and appreciated contacts with pupils and, in particular, with teachers and very often (b) achieved learning progress in many small steps. For example, in phonetic reading, naming pictures, copying words and increasingly using spoken language for communicating requests (“Please I want x”, “Please I like better x”), (c) made efforts to identify regularities and participate in shared activities, and (d) profited from using visual schedules and activity plans.

To summarize, evidence of improved child functioning came from multiple sources, such as therapist, teacher, and parent’s reports, as well as multiple measurement methods including systematic behavioural time sampling, quantitative training outcome inventories, and qualitative-verbal data collections. The results are consistent over different developmental domains, thus indicating improvements in language and communication skills, play and pre-academic skills, and self-management abilities, as well as enhancement of emotional and social functioning.

### 9.2 Parent outcomes

The results of parent outcomes for the home program intervention are summarized as follows:

(1) *Implementation of Structured Teaching Methods Inventory*: Results indicate that at Post 7 of 9 *Structured teaching* strategies were implemented reliably: Physical Structure, Daily Schedule, Work & Learning System, Concise Directions, Prompting, Consequence-Based Methods (reinforcement), and Language and Communication Skills Training; at Pre no strategy was implemented.

(2) *Parent Autism Concept Quality*: Results indicate a score of 5 (maximum) at Post-occasion reflecting mother’s adequate cognitions, attitudes and expectations relating to autism and resulting consequences for M. For example, she contradicted her mother strongly, who blamed her for having caused M’s problems by parenting faults. Further, she took much effort to place M as disabled child in an inclusion classroom and finally was successful. At Pre-occasion, mother attained a score of 2 reflecting self-blaming and less optimistic attitudes relating to M’s school transition.

(3) *Program evaluation on the basis of the Parent Treatment Evaluation Questionnaire*: The program outcome was rated “very positively” by the mother with a score of 4.0 on the “effectiveness scale”. Similarly, the professional-parent relationship was rated very positively, with a score of 3.9 on the “intervention process scale”.

In sum, evidence of improved parent functioning comes consistently from two outcome sources, reflecting the adoption of both a functional autism concept most helpful for promoting M and advanced skills of implementing *Structured Teaching* methods in the Family. Further, the process as well as the effects of the home programming intervention was evaluated very positively.

### 9.3 Teacher-related outcomes

The following results of teacher outcomes resulting from extending the home program to school can be shown:

(1) *Teacher Implementation of Structured Teaching Inventory*: Results from the Inventory indicate that at Post, 5 of 9 structured teaching strategies were implemented explicitly and reliably: Physical Structure in classroom, Picture Schedule, Concise Directions, Prompting, and Consequential Methods (e.g., contingent praise, applauding). According to M's classroom teacher, the implementation of a daily schedule was extremely helpful for his orientation. It contained picture symbols of various activities in the classroom. For example, it enabled him to stay more patiently in line among other pupils and wait for preferred activities such as working on PC; at Pre 3 strategies were implemented.

(2) *Teacher Autism Concept Quality Inventory*: Results indicate a score of 3 (maximum) for M's classroom teacher meaning that the classroom teacher showed good autism concept quality, which included high self-efficacy and control beliefs regarding M. Concepts from the autism parent group training manual (Probst *et al.*, 2008) and corresponding model video material were integrated into the individualized education plan for M. M was continuously supported in the inclusion classroom, which included 17 normally developed children and 3 children with disabilities, by a semi-professional assistant who worked with him in a one-to-one setting and joined him for activities in groups. M's tendencies of rigid and compulsive behaviours were counteracted by proactive communication strategies by which future events (e.g., excursions) were made as predictable as possible. At Pre the teacher attained a score of 2 reflecting somewhat lower self-efficacy and control beliefs.

To summarize, evidence of improved teacher functioning comes consistently from both outcome measures revealing the existence of a beneficial autism concept as well as enhanced skills of implementing *Structured Teaching* appropriate for M in the classroom.

### 9.4 Health-professional related outcomes

Results from health professional related measures suggest that therapist expert reports and additional therapist-health professional interactions contributed to the provision of social support in the form of (a) giving health insurance and social welfare benefits to the family, (b) assisting parents in school placement issues, such as transition from preschool to primary school, and (c) allocating full-time inclusion classroom aid for M in primary school.

Overall, there is evidence of positive effects of therapist-health professional interactions on family and classroom environments.

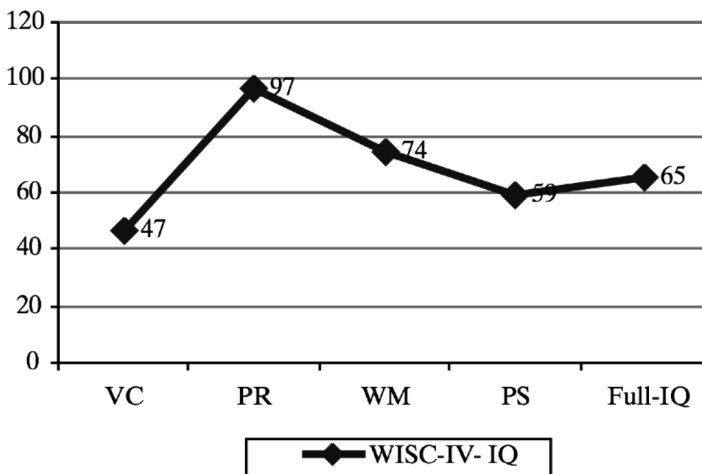
### 9.5 Results for the Follow-up 1 assessment

(1) *Autism symptoms:* In ADOS (module 2, for non-fluently speaking individuals), M attained at follow-up 1 (aged 15) scores exceeding cut-offs for autism in both communication scale [ $A = 7$ ; cut-off = 5] and social interaction scale [ $B = 13$ ; cut-off = 6] and composite scale [ $A+B = 20$ ; cut-off = 12], and thus revealing ongoing significant autism symptomatology.

(2) *Overall cognitive functioning:* In WISC-IV (Figure 5), M attained a Full Scale-IQ of 65, a Verbal Comprehension Index of 47, a Perceptual Reasoning Index of 97, a Working Memory Index of 74, and a Processing Speed Index of 59. According to this result, M's overall cognitive functioning scores in the area between subnormal intelligence and mild intellectual disability. However, the results from WISC-IV reveal a marked uneven cognitive profile with high *deficits* in verbal comprehension and perceptual reasoning ability in the *normal* range.

(3) *Functioning in Family:* According to parent reports, at an age of 8 years M first addressed his parents with “papa (daddy)” and “mama (mom)” and greeted strangers with “hello man”. “What is it?” questions were first asked with 8.5 years. From an age of 10 on, M regularly reported about what he had drawn in school and what he wanted to do in the near future (e. g. watching a special TV program). He enjoyed continuously going to both primary and later secondary school. After school, he predominantly preferred to stay alone in his room drawing, watching and reading pictured books (e.g., with dinosaurs), and watching TV. There were no serious behaviour problems at home; however, a moderate problem was that he had a very hard time complying with a strict ban (e.g. “No more TV!”).

Figure 5 - Results for M in WISC-IV at “Follow-Up-I”



Note: y-coordinate: IQ scores; x-coordinate: VC= Verbal Comprehension Index, PR= Perceptual Reasoning Index, WM= Working Memory Index, PS= Perceptual Speed Index.



### *9.6 Results for Follow-up 2*

(1) *Functioning in Classroom*: According to school reports from grade 1 to 10, M. attended an inclusive class including 17 normally developed and 4 developmentally disabled children at primary school (aged 7-11), then an inclusive class at secondary school (similarly structured as in primary school; aged 11-16), which he completed at the age of 16. For the most part during his primary and secondary school time, he was given individual classroom support. The final grade certificate at the end of the 10th grade described M as “friendly and in love with life”, a student who in fact preferred contact with his familiar teacher, but increasingly often approached peer students. Further, the report said that M could read, write and understand basic texts in German, and was able to master adding, subtracting, multiplying and dividing tasks in the domain of numbers 1 to 100, and could read, write and understand basic texts in English, and that he skilfully completed technical and prevocational tasks with sheet metal, wood, and textiles, and finally acquired respectable skills in cooking.

At present, M attends a preparatory class for some vocational training for attending a sheltered workshop in the near future.

(2) *Functioning in Family*: According to the mother - who has been a single parent for a few years and presently works part-time as employee in a Russian-German logistics company, M has continued functioning well in the family and has a good relationship with his younger sister. In addition, the mother reported that M attends a preparatory class for vocational training and that she was trying to find a day care centre for him with sheltered vocational training in technical and artistic domains. In general she is optimistic about the immediate future.

### *10. Conclusions of Study 2*

In the present descriptive single-subject study, the effectiveness and social validity of a TEACCH-based home programming intervention were evaluated involving a 5-year old boy with autism (M), and his parents, with the focus being on the mother, and also his classroom teachers and relevant health professionals. The multiple method measures used for evaluation included video-based behavioural observation, standardized developmental tests, structured interviews, quantitative questionnaire and inventories, and qualitative-verbal information collection. The pre/post intervention results based on child, parent, therapist, teacher, and health professional sources, showed (a) improved child functioning in language, communication, play and pre-academic domains, improved family adaptation, successful transition to primary school and adequate classroom adaptation, (b) enhanced parent functioning in terms of structured teaching skills and functional health cognitions in terms of an individualized autism concept, as well as strong acceptance of both home programming process and outcomes, (c) enhanced teacher functioning in terms of autism-specific teaching methods

and expanded health cognitions regarding autism, and (d) beneficial health professional outcomes providing relevant social support for parents and teachers.

Further, the follow-up assessments suggest that positive trends in child functioning both in family and classroom were maintained, while autism symptoms and an uneven cognitive profile with a low aptitude for verbal abilities and a higher aptitude in visual reasoning continue to exist (cf. Howlin, 2004).

Overall, these results are consistent with a number of studies on ASD home programming trainings in various countries (Schopler, 1997; Schopler, 2005; Mesibov, Shea, & Schopler, 2006; Mesibov & Shea, 2009; Welterlin, 2009).

Limitations to the internal validity of the study include the lack of internationally common child behaviour measures as, for example, used in the studies described in Probst *et al.* (2010), and the use of an A-B design, in which pre/post intervention effects cannot be clearly separated from the effects of other variables, such as the child's maturation or numerous uncontrolled environmental factors. Limitations to the external validity are caused by the problem that findings originating from a single subject study can only be generalized to other subjects and settings with due caution. However, though the overall positive results must therefore be viewed carefully, they can still make some contributions to the further development of parent in-home programs.

Overall, the results of this first formal TEACCH-based home programming evaluation in the German-speaking world are encouraging and suggest some tentative evidence for both clinical and social validity. The positive social acceptance of the program by parents and classroom teachers supports the assumption that this kind of intervention does function in everyday life (Kazdin, 2008).

Considering the medium-intensity of about 100h and the corresponding estimated medium cost of the TEACCH home program, it might fit the needs and capacities of local health care systems. Furthermore, there is evidence resulting from an international comparative study (Häussler, 1998) and also clinical expertise (e. g. Degner & Müller, 2008) that German parents want to be more involved in the treatment of their children and adolescents than is currently the case at autism treatment centres whose administrative policies are frequently based on strongly child-focused orientations where, to put it simply, parents take their child to the autism centre for one hour of child-centred, one-to-one therapy, and pick them up one hour later once a week over a period of one or two years, and where parent support is only sporadically provided as an adjunct intervention. Similarly, there is also evidence for the need of more involvement of classroom teachers in the treatment of their students, such as providing group and individual teacher education and skills trainings at autism treatment centres or related health care institutions (cf. Probst & Leppert, 2008).

## 11. Overall conclusions

In the present article, two TEACCH-based intervention outcome studies addressing families with children with autism and aiming at tertiary prevention or rehabilitation (Probst *et al.*, 2010) are reported. Both the education and skills training parent group study and the home-based child-parent training single case study are *first* formal evaluations of TEACCH-based family interventions in the German-speaking world.

Common aims of tertiary-preventive and rehabilitative intervention across both reported studies included (a) reducing behavioural and non-core symptoms, enhancing social-communicative and developmental abilities and thus strengthening autonomy and social participation in children with autistic disorders, and (b) enhancing skills and coping abilities of care-takers in family and classroom by teaching a science-based and individually shaped concept of autism as well as educational strategies and skills.

Though there are limitations to the internal and external validity, both studies provide tentative evidence for (a) the effectiveness of TEACCH-oriented family interventions in terms of child, parent, family and classroom outcomes, and (b) practical relevance and social validity of the intervention method in terms of parental acceptance as well as meeting the needs of the current health care setting, and the values and attitudes of a significant number of German parents.

The evaluation methodology followed a multimodal and multi-method strategy.

The results of both studies are consistent with recent evaluative studies on TEACCH-based interventions for autism from the USA (Welterlin, 2009) and Italy (Panerai *et al.*, 2009), and with evaluative studies conducted in Germany on TEACCH-based interventions for autism within various educational settings including a specially equipped classroom for children with intellectual disabilities (Probst & Leppert, 2008), a residential home for children with severe developmental disabilities (Probst *et al.*, 2010, study 1) and a day care and vocational setting for adults with autism and related disabilities (Probst *et al.*, 2010, study 2).

Furthermore, the reported findings are in congruence with international review studies (NRC, 2001; Francis, 2005; Singer *et al.*, 2007).

All five studies examining the effectiveness and social validity of the TEACCH program in clinical and educational settings in Germany (Probst & Leppert, 2008, Probst *et al.*, 2010: study 1 and 2), and the two studies by Probst & Glen (reported in the present paper) were coordinated within a clinical research program by the first author at the Department of Psychology of University of Hamburg (Germany).

The evaluation strategy was guided by a concept of dissemination of novel interventions in public mental health and educational systems adapted from Dingfelder & Mandell (2010) focussing on a stepwise strategy begin-

ning with single subject and within-group studies examining treatment effects (“effectiveness”, NRC, 2001) in real-life clinical practice conditions and naturalistic settings, and followed by studies addressing effects of interventions more in controlled laboratory settings (“efficacy”, NRC, 2001) in later steps, instead of using the efficacy-to-effectiveness sequence, called also “stage pipeline” model (Rohrbach, Grana, Sussman, & Valente, 2006, as cited in Dingfelder & Mandell, 2010) criticised as counterproductive in creating “most robust practice-robust treatments” (Dingfelder & Mandell, 2006).

Further research should expand (a) to stricter controlled single-subject and within-subject studies, and (b) to controlled between-group studies systematically examining the impact of child variables (e.g., symptomatology, developmental functioning, and personality), parent/caregiver variables (e.g., psychological and social-economical resources), and therapist variables (e.g., training, personality) on intervention outcomes. Research strategies of this kind can reduce the gap between clinical research and practice, enhancing the knowledge base and improving patient and student care (cf. Kazdin, 2008).

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## Reducing explicit and implicit prejudice toward disabled colleagues: effects of contact and membership salience in the workplace

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### Abstract

*In the present study, membership salience was tested as a moderator of the effects of contact on emotions and explicit and implicit attitudes toward the disabled. Participants were non-disabled employees of firms and cooperative societies; they worked in contact with colleagues with psychiatric problems. Results indicated that quantity and quality of contact improved outgroup evaluations, both within and outside the contact situation. Consistent with intergroup contact theory (Brown & Hewstone, 2005), the positive effects of contact on anxiety and empathy toward disabled colleagues generalized to the whole category of the disabled when group distinctions were salient within the contact setting. Notably, frequent and cooperative contact also reduced implicit prejudice toward the general disabled category. Theoretical and practical implications of findings are discussed.*

**Keywords:** intergroup contact at work, membership salience, intergroup empathy and anxiety, implicit attitudes, contact with disabled colleagues

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## 1. Introduction

Research has consistently shown that the disabled are a strongly devalued group (Murphy, 1995; Whaley, 1997; Saetermoe, Scattone, & Kim, 2001). Prejudiced attitudes may have important practical consequences, and constitute a barrier to the integration and participation of the disabled in social life (Livneh & Antonak, 1997; Smart, 2002). According to social psychologists, one of the most effective strategies to improve attitudes toward stigmatized groups and limit prejudice is represented by intergroup contact. The contact hypothesis (Allport, 1954) suggests that encounters between members of different groups favor the development of more harmonious intergroup relations, when certain key-conditions are met: members with similar status within the contact situation should cooperate for common goals, and contact should be sustained by social norms (for an analysis of the relative importance of optimal contact conditions, see Koschate & van Dick, in press). The extensive meta-analysis by Pettigrew and Tropp (2006) consistently demonstrated that contact is a powerful tool to reduce prejudice, especially when optimal conditions are present. The contact hypothesis, however, does not specify *when* positive intergroup attitudes following contact will generalize beyond the immediate situation (see Pettigrew, 1998). To address this limitation, different models, grounded on social identity (Tajfel, 1981) and self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), have been proposed with the aim of extending the basic principles of the contact hypothesis and explain which factors promote generalization. In the present study, we will focus on the intergroup contact theory (Brown & Hewstone, 2005; Hewstone & Brown, 1986).

The aim of the current study is to test the intergroup contact theory (Brown & Hewstone, 2005), by examining the role of membership salience as a moderator of the contact effects. The relationship between non-disabled and disabled colleagues (psychiatric patients), in the workplace, will be considered, and the generalization of contact effects to the whole category of the disabled will be studied.<sup>3</sup> We also measure emotions, given the increasing importance accorded to affect in contact research (Pettigrew & Tropp, 2008). Furthermore, to the extent that self-reports concerning the disabled might be biased by social desirability motives (Feinberg, 1967; Wong, Chan, Cardoso, Lam, & Miller, 2004), we included a measure of implicit attitude (evaluation). To our knowledge, this is the first time that the moderator role of membership salience in contact is evaluated considering the relationship between the non-disabled and disabled, and assessing both explicit and implicit attitudes.

This study has theoretical and practical goals. On one hand, it evaluates the intergroup contact theory (Brown & Hewstone, 2005), by considering

<sup>3</sup> The category of people with psychiatric problems includes, for instance, schizophrenics, people with personality or mood disorders, psychotics.

explicit and implicit attitudes, and an intergroup relation generally underestimated in testing this model. On the other hand, by indicating when contact is more effective, our study represents an important contribution for practitioners, aiming to create harmonious relationships between the non-disabled and disabled, within and outside the work context.

## 2. The intergroup contact theory

According to Brown and Hewstone (2005; Hewstone & Brown, 1986), increasing membership salience within settings of cooperative contact should have positive effects on intergroup relations. If membership is salient generalization of positive contact effects is more likely, since outgroup members are associated to the outgroup as a whole (Rothbart & John, 1985).

There is now strong evidence concerning the importance of membership salience for the generalization of contact effects (e.g., Brown, Vivian, & Hewstone, 1999; Voci & Hewstone, 2003; Binder, Zagefka, Brown, Funke, Kessler, & Mummendey, 2009). Nevertheless, not much research has tested the moderator role of membership salience in the generalization process considering the relation between the non-disabled and disabled. In a study by Desforges and colleagues (1991), university students interacted with a confederate presented as a former mental patient. Results showed that cooperative contact produced more positive attitudes toward former mental patients for those who had prior negative attitudes toward this group and perceived the confederate as a typical exemplar of the category of former mental patients. Maras and Brown (2000) examined the attitudes toward the disabled, displayed by non-disabled children aged 5-11 years. The authors considered three types of disability: physical disabilities, learning disabilities, hearing impairment. Children were recruited either from schools where differences were emphasized (categorized contact), or from schools where a clear identification of the disabled as a distinct group was avoided (decategorized contact). Findings revealed that correlations between attitudes toward known and unknown outgroup members (ratings of how much participants would play with known and unknown disabled) were somewhat stronger in categorized than decategorized schools. However, as acknowledged by authors, since bias favoring the non-disabled was generally stronger in the categorized than decategorized schools, generalization could concern negative and not positive attitudes. It should be observed that contact in the categorized schools hardly met Allport's (1954) optimal conditions, thus limiting the possibility for positive attitude generalization.

The results of the two studies offer only weak support for the intergroup contact theory (Brown & Hewstone, 2005). In the study by Desforges and colleagues (1991), contact was with a confederate and not with a real for-

mer mental patient. The fact that optimal conditions were not fully met in the categorized schools (Maras & Brown, 2000) does not permit a proper test of the intergroup contact model: membership salience might have a moderator role in the generalization of contact effects only when settings, which meet Allport's conditions, are considered. Additional research is needed to test the intergroup contact theory in the context of relationships between the non-disabled and disabled.

### 3. Studies on contact with the disabled

There is strong evidence supporting the idea that intergroup contact improves the relations between the non-disabled and disabled (e.g., Maras & Brown, 1996; Slininger, Sherrill, & Jankowski, 2000). The meta-analysis by Pettigrew and Tropp (2006) showed that contact is related with lower levels of prejudice toward different types of disabilities.

Despite this wide literature, only a few studies have examined the effects of contact between non-disabled and disabled employees within the workplace (see Mangili, Ponteri, Buizza, & Rossi, 2004). For instance, Hetu and collaborators (Hetu, Getty, Beaudry, & Philibert, 1994) found that frequency of contact with hearing-impaired colleagues improved attitudes and increased helping behaviors toward them. These studies generally lack generalization measures, with some exceptions. For instance, Tachibana and Watanabe's results (2004) revealed that Japanese respondents' attitudes toward intellectual disabilities improved as a function of contact at work. However, most of the studies concerning contact in the workplace focused on attitudes held by employers toward the integration of the disabled in the work setting (e.g., Diksa & Rogers, 1996; Rimmerman, 1998).

On the basis of the reviewed literature, we expect that frequent and cooperative contact at work will lead the non-disabled to evaluate disabled colleagues more positively, and to feel more positive emotions toward them. Furthermore, according to the intergroup contact theory (Brown & Hewstone, 2005), the positive effects of contact should generalize outside the work situation, when group membership during contact is salient.

### 4. Contact and implicit prejudice reduction

Over the last two decades, scholars have devoted a growing attention to the assessment of implicit attitudes, with the aim of detecting automatic associations that are difficult to tap with self-report measures (Fazio, Jackson, Dutton, & Williams, 1995). Implicit attitudes are activated by the mere presence of an attitude object; they are largely unintentional, impervious to conscious control, and, as a consequence, less influenced by social desirability concerns or

self-presentation biases (e.g., Devine, Plant, & Blair, 2001; Nosek, 2007). Research in this field has demonstrated that implicit attitudes have some flexibility and can be modified by the social context (see Blair, 2002, for a review).

Surprisingly, only a few studies have investigated the relationship between contact and implicit attitudes. Taken together, they reveal that high levels of contact are generally associated with less implicit prejudice. However, there is not full consensus with respect to the type of contact that is more relevant for attitude change. Some studies, in fact, found that quantity of contact predicted lower endorsement of negative implicit intergroup attitudes (e.g., Tam, Hewstone, Harwood, Voci, & Kenworthy, 2006). Similarly, Pruett and Chan (2006) found that the amount of contact with people who had a disability was a significant predictor of improved implicit attitudes toward the disabled. In other studies, the quality of intergroup relationship was more relevant to the implicit prejudice reduction (e.g., Aberson, Shoemaker, & Tomolillo, 2004; Vezzali & Giovannini, 2011). There is also evidence that both quantity and quality of contact are necessary to improve implicit attitudes. For instance, Aberson and Haag (2007) found, in a sample of White-American students, that the interaction between quantity and quality of contact predicted reduced implicit prejudice toward African-Americans (for a demonstration of the role of frequent qualitative contact on the improvement of implicit interracial attitudes in a college environment, see Shook & Fazio, 2008).

Although the interest of investigators for the relationship between contact and implicit attitudes is growing, we are not aware of any study directly examining the joint effects of contact and membership salience on intergroup attitudes tapped at an implicit level. Our expectation is that both the quantity and the quality of the contact experience play a role in reducing implicit prejudice (Aberson & Haag, 2007). This hypothesis is consistent with dual-process models, such as the associative-propositional evaluation model (APE model; Gawronski & Bodenhausen, 2006; see also the reflective-impulsive model, Strack & Deutsch, 2004), which proposes that, whereas explicit attitudes stem from higher cognitive processes and are based on syllogistic inferences, implicit attitudes merely depend on associative processes. According to this model, associative links between elements stored in memory can be activated automatically at the presence of a stimulus, and are independent from the fact that the person perceives the resulting evaluation as true or false. Importantly, implicit attitude change may result from changes in the associative structure as a function of evaluative conditioning processes. There is evidence demonstrating that the repeated pairing of positive or negative stimuli with an attitude object can produce a change in implicit attitudes in a direction consistent with the valence of the processed stimuli (e.g., Karpinski & Hilton, 2001; Mitchell, Anderson, & Lovibond, 2003; Olson & Fazio, 2006). Our prediction is that the repeated association (quantity of contact) of the disabled with positive experiences

(cooperation: quality of contact) will enhance implicit evaluations of the disabled category, thus reducing implicit bias (see Gawronski & Bodenhausen, 2006; Rudman, 2004; Strack & Deutsch, 2004). However, similar to explicit attitudes, frequent and positive contact should improve implicit attitudes toward the disabled as a whole only when group membership is salient (that is, when the associative link between known and unknown outgroup members is maintained; Rothbart & John, 1985).

## 5. Aims and hypotheses

The aim of this study was to examine the role of membership salience as a moderator of the effects of contact on attitudes and emotions toward disabled colleagues and the wider category of the disabled. Participants were non-disabled employees of firms and cooperatives in a Northern Italian city; they worked in contact with colleagues presenting psychiatric disorders. The disabled had been employed by taking advantage of a government law, defining the rules for the employment and integration at work of the disabled.

Participants were administered a questionnaire containing the following measures: Allport's (1954) optimal conditions (cooperation, common goals, equal status, institutional support), quantity and quality of contact, membership salience, evaluation (attitude)<sup>4</sup> and emotions (anxiety, empathy) toward both known and unknown outgroup members. The Go/No-go Association Task (GNAT; Nosek & Banaji, 2001), which represents a development of the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998), was used to reveal implicit attitudes. Both of these techniques measure implicit attitudes by assessing automatic associations between target concepts (e.g., non-disabled vs. disabled) and attributes (positive vs. negative). The benefit of using GNAT is that it allows independent measures of the attitude toward each of the two target concepts.

To recap, we make the following predictions:

*Hypothesis 1.* Both quantity and quality of contact at work should improve explicit evaluations and emotions toward disabled colleagues.

*Hypothesis 2.* The effects of contact on explicit evaluations and emotions should generalize to the whole category of the disabled, when group distinctions during contact are salient.

Concerning implicit attitudes, we predict that:

*Hypothesis 3.* Cooperative contact at work should improve the implicit evaluation of the whole category of the disabled, and reduce implicit bias, when it is frequent and membership salience during contact is high.

<sup>4</sup> In the context of this study, the terms "evaluation" and "attitude" will be used as synonyms.

## 6. Method

### 6.1 Sample

Participants were 74 non-disabled employees of firms and cooperatives (25 males, 49 females); they worked in contact with colleagues presenting psychiatric problems. Mean age was 39.78 years ( $SD = 11.42$ ). Most of participants worked in the sectors of services (59.5%) and commerce (33.8%).

### 6.2 Procedure

The research was introduced as a study on the relations between the non-disabled and disabled. Disability, according to the Italian law n.104/1992, is defined as a restriction or lack of ability to perform an activity in a way commonly accepted as standard for a man or woman. Participants, examined individually at the workplace, were asked to complete a questionnaire divided in two sections: the first concerned relations with disabled colleagues, the second was relative to relations with the whole category of the disabled. Implicit attitudes were assessed by means of a notebook between the first and the second section of the questionnaire. Individual sessions were run in absence of disturbing stimuli, and lasted about 45 minutes.

### 6.3 Instruments

#### *Questionnaire*

*Optimal contact conditions.* One seven-step item measured participants' perception of status at work: "Thinking about the working position of the non-disabled, how do you evaluate the working position of the disabled in this workplace?" Scores from 1 to 3 indicated higher status of the disabled, compared to the non-disabled; 4 indicated equal status; scores from 5 to 7 indicated higher status of the non-disabled. Perceptions of cooperation, common goals and institutional support were measured by the following three items: "My job requires cooperation with my disabled colleagues"; "I and my disabled colleagues are expected to achieve common goals"; "This firm/cooperative favors integration between the disabled and non-disabled." All three items had a seven-step scale ranging from 1 (*not at all*) to 7 (*very much*).

*Quantity of contact.* Two items (see Vezzali, Capozza, & Falvo, 2009) were used: "How much contact do you have with disabled colleagues at work?"; "How often do you interact with disabled colleagues during work?" The five-step scale ranged from *none* (1) to *very much* (5), for the first item, from *never* (1) to *always* (5), for the second item. The two items were averaged to obtain an index of quantity of contact (Cronbach  $\alpha = .86$ ).

*Quality of contact.* Quality of contact was measured by eight seven-step bipolar scales (e.g., competitive/cooperative, formal/informal, un-

friendly/friendly), in which 1 indicated the negative and 7 the positive pole; 4 was the neutral point (see Capozza, Vezzali, Trifiletti, Falvo, & Favara, 2010). The eight items were averaged to form a single measure of quality of contact ( $\alpha = .71$ ).

*Membership salience.* The awareness of group distinctions during contact was assessed with four items, adapted by Vezzali, Capozza, Mari, and Hichy (2007), and Voci and Hewstone (2003). Examples are: "During contact at work with disabled colleagues, are you aware that you belong to different groups?"; "During contact at work with disabled colleagues, to what degree do you perceive them as typical members of the disabled category?". All items had a seven-step scale (1 = *not at all*; 7 = *very much*). Items were averaged to form a reliable measure of membership salience ( $\alpha = .70$ ), with higher scores meaning stronger awareness of categorical distinction during contact.

*Emotions toward known outgroup members.* Participants were asked to indicate the emotions felt during contact with disabled colleagues on a scale ranging from 1 (*not at all*) to 7 (*very much*). Anxiety was measured by 15 items (e.g., anxious, worried). Four items (e.g., "During contact at work with your disabled colleagues, to what extent do you feel you share their emotions?"), adapted by Capozza and collaborators (2010), tapped empathy (Batson, 1998). For each emotion, items were averaged to form a single reliable index ( $\alpha = .88$ , for anxiety;  $\alpha = .89$ , for empathy). Higher scores reflect stronger feelings of anxiety and empathy, respectively.

*Evaluation of known outgroup members.* Participants rated disabled colleagues on five semantic differential scales, representing the evaluation factor (e.g., undesirable/desirable, unpleasant/pleasant). On the seven-step scale, 1 was given to the negative and 7 to the positive pole (4 = *neither/nor*). Ratings were averaged to form a single score ( $\alpha = .77$ ).

*Emotions toward unknown outgroup members and their evaluation.* Participants rated the emotions felt toward the general category of the disabled and evaluated this category with the same items used for the known outgroup. Items were combined to form reliable measures ( $\alpha = .91$ , for anxiety;  $\alpha = .91$ , for empathy;  $\alpha = .86$ , for outgroup evaluation).

#### GNAT

The GNAT (Nosek & Banaji, 2001) was run using Inquisit software (Version 1.33; Draine, 2003). Four types of stimuli (words) were used: five words referred to the disabled (e.g., invalid, disabled); five words referred to the non-disabled (e.g., able, healthy); 10 stimuli were positive words; 10 were negative words. Words referring to the non-disabled and disabled were matched for length. Positive and negative words were matched for valence and length. We used four experimental blocks of 40 trials (10 for each category of stimuli; for the non-disabled and disabled, the five stimuli were repeated twice). Stimuli were shown randomly, one at a time, in the center



of the computer screen. Each experimental block was preceded by 16 practice trials, responses to these trials being eliminated from analyses.

In each block, a target category (e.g., non-disabled) was paired with a target attribute (e.g., positive words). Target labels appeared on the upper right and the upper left of the screen as reminders. The task of participants was to press the space bar (go), within the 800 ms deadline, if the stimulus presented belonged to the target category or the target attribute, and to ignore the trial (no go), if it belonged to the contrasting category or attribute (distracters). The subsequent trial appeared 400 ms (*inter-stimulus interval*) after participant hit the space bar, or the response deadline was reached. Correct responses were followed by a green "O," incorrect responses by a red "X," each lasting on the screen 200 ms. Two blocks measured the attitude toward the disabled (disabled + positive words; disabled + negative words), and two the attitude toward the non-disabled (non-disabled + positive words; non-disabled + negative words).

## 7. Data analyses

### 7.1 *Introductory analyses*

*Measures included in the questionnaire.* Means and standard deviations of measures are presented in Table 1. Correlations between variables are shown in the Appendix. As can be noted, Allport's (1954) optimal conditions were present in the context examined. Indeed, cooperation, common goals and institutional support within the contact setting were high, the respective mean being much higher than the mid-point of the scale. Status in the workplace was perceived as not very dissimilar, although slightly higher for the non-disabled than disabled. Thus, the setting analyzed was ideal for allowing contact to improve intergroup relations. Both quantity and quality of contact were high; membership salience was not particularly low. In general, relations with the disabled were positive, and, not surprisingly, emotions toward the known disabled and their evaluation were slightly more positive than the corresponding emotions and evaluation of the disabled in general.

Table 1 - Means and standard deviations of the measures included in the questionnaire

<i>Measure</i>	<i>M</i>	<i>SD</i>
Status at work	4.77*	0.94
Cooperation at work	5.84*	1.29
Institutional support at work	5.69*	1.26
Common goals at work	5.85*	1.48
Quantity of contact	3.41*	0.93
Quality of contact	5.48*	0.71
Membership salience	2.31*	0.91
Anxiety toward known outgroup members	2.10*	0.76
Empathy toward known outgroup members	4.20	1.38
Evaluation of known outgroup members	5.52*	0.91
Anxiety toward unknown outgroup members	2.54*	0.79
Empathy toward unknown outgroup members	3.33*	1.30
Evaluation of unknown outgroup members	5.19*	0.93

Note: The asterisk indicates that the mean differs from the central point of the scale, which is 4. The central point is 3 for quantity of contact.

\* $p < .001$ .

*GNAT*. For each block of trials, a sensitivity index ( $d'$ ), based on signal detection theory (Green & Swets, 1966), was calculated; it measures the ability in discriminating targets (the signal) from distracters (the noise). The  $d'$  index is based on the assumption that participants should be more able to discriminate signals from noise when the two targets are associated, relative to when the association is weak. D-prime is obtained by subtracting the proportion of false alarms (participants incorrectly pressed the space bar, when responding to distracters) from the proportion of hits (participants correctly pressed the space bar after the presentation of targets). Both proportions are converted into  $z$ -scores: the higher  $d'$ , the stronger the ability to discriminate targets from distracters, namely, the stronger the association between the target category and the target attribute (Nosek & Banaji, 2001).

Sensitivity scores were submitted to a 2 (Target group: non-disabled vs. disabled)  $\times$  2 (Attribute: positive vs. negative) ANOVA, with both factors serving as within-subjects variables. A main effect of attribute emerged,  $F(1, 73) = 12.82, p = .001, \eta^2 = 0.15$ , qualified by the expected two-way in-

teraction, Target group  $\times$  Attribute,  $F(1, 73) = 214.91, p < .001, \eta^2 = 0.75$ . Simple effects analysis revealed significant implicit ingroup bias: participants associated the disabled more with negative ( $M = 2.30, SD = 0.90$ ) than with positive words ( $M = 1.14, SD = 0.82$ ),  $F(1, 73) = 62.11, p < .001, \eta^2 = 0.46$ , whereas they associated the non-disabled more with positive ( $M = 2.48, SD = 0.88$ ) than with negative words ( $M = 0.73, SD = 0.63$ ),  $F(1, 73) = 265.95, p < .001, \eta^2 = 0.78$ .

Three indices were then calculated: implicit outgroup evaluation, implicit ingroup evaluation, and implicit ingroup bias. For the implicit outgroup evaluation, the difference was calculated between the  $d'$  relative to the block disabled + positive words and the  $d'$  relative to the block disabled + negative words; higher scores reflect a more positive implicit evaluation of the outgroup. For implicit ingroup evaluation (computed in order to calculate implicit ingroup bias), the blocks were: non-disabled + positive words and non-disabled + negative words. Implicit ingroup bias was calculated as the difference between implicit ingroup and implicit outgroup evaluation: the higher the score, the stronger implicit ingroup bias.

## 7.2 Moderation analyses

To test the hypotheses, hierarchical regression was applied. For each outcome measure, in the first phase (Step 1) we measured the main effect of the two predictors (quantity and quality of contact) and the hypothesized moderator (membership salience); in the second phase (Step 2), the two-way products were added; in Step 3, we entered the three-way interaction. Dependent variables were: anxiety and empathy felt toward known and unknown outgroup members, and their evaluation; implicit outgroup evaluation, implicit ingroup bias. The two predictors and the moderator were centered prior to multiplication as a means to avoid multicollinearity (Jaccard, Wan, & Turrisi, 1990). Results are presented in Table 2.

*Known outgroup members.* As can be noted in Table 2a (Step 1), in line with our first hypothesis, both quantity and quality of contact had positive effects on empathy and evaluation of disabled colleagues. The effects of membership salience never reached conventional levels of significance. Results also revealed that the main effect of contact quality on anxiety (Step 1; Table 2a) was qualified by a marginally significant two-way interaction (Step 2; Table 2a). Simple slopes analyses showed that quality of contact reduced anxiety toward the disabled at work when membership salience was high,  $b = -.68, t = 3.81, p < .001$ , but not when membership salience was low,  $b = -.18, t = 1$ . The three-way interactions were never significant (Step 3; Table 2b).

*Unknown outgroup members, explicit measures.* Quality of contact had positive effects on all the outcome variables, while the effects of quantity of contact and membership salience were nonsignificant (Step 1; Table 2a). However, the main effect of quality of contact was qualified by the three-way interaction for the measures of anxiety and empathy (marginal effect)

Table 2(a) - Hierarchical regression evaluating the moderating effect of membership salience on the relation between quantity and quality of contact and dependent variables (standardized regression coefficients)

	Dependent variables							
	Anxiety		Empathy		Outgroup evaluation		Implicit outgroup evaluation	Implicit ingroup bias
	Known	Unknown	Known	Unknown	Known	Unknown	Unknown	Unknown
<i>Step 1</i>								
A Quantity	.10	.10	.35**	.02	.25*	.12	.02	-.04
B Quality	-.44***	-.28*	.34**	.38**	.42***	.35**	.22	-.32**
C Membership salience	-.03	.17	.02	.04	-.08	.03	.22	-.27*
$R^2$	.17	.13	.31	.14	.31	.16	.08	.16
$F$	4.83**	3.42*	10.55***	3.90*	10.49***	4.40**	2.16	4.27**
$df$	(3, 70)	(3, 70)	(3, 70)	(3, 70)	(3, 70)	(3, 70)	(3, 70)	(3, 70)
<i>Step 2</i>								
A Quantity	.08	.10	.35**	.03	.23*	.11	.03	-.04
B Quality	-.40***	-.26*	.34**	.34**	.42***	.36**	.15	-.26*
C Membership salience	-.14	.18	.01	.11	-.14	-.00	.32**	-.31*
A × B	-.05	-.20	.07	.12	.01	-.01	.46***	-.37**
A × C	.15	-.12	.04	-.08	-.06	.05	.19	-.13
B × C	-.23 <sup>†</sup>	.05	-.04	.14	-.20	-.09	.16	-.02
$R^2$	.26	.16	.32	.20	.34	.17	.29	.27
$F$	3.90**	2.16 <sup>†</sup>	5.18***	2.76*	5.80***	2.26*	4.60***	4.04**
$df$	(6, 67)	(6, 67)	(6, 67)	(6, 67)	(6, 67)	(6, 67)	(6, 67)	(6, 67)
$F_{ch}$	2.63 <sup>†</sup>	.91	.17	1.54	1.07	.27	6.53***	3.38*
$df$	(3, 67)	(3, 67)	(3, 67)	(3, 67)	(3, 67)	(3, 67)	(3, 67)	(3, 67)

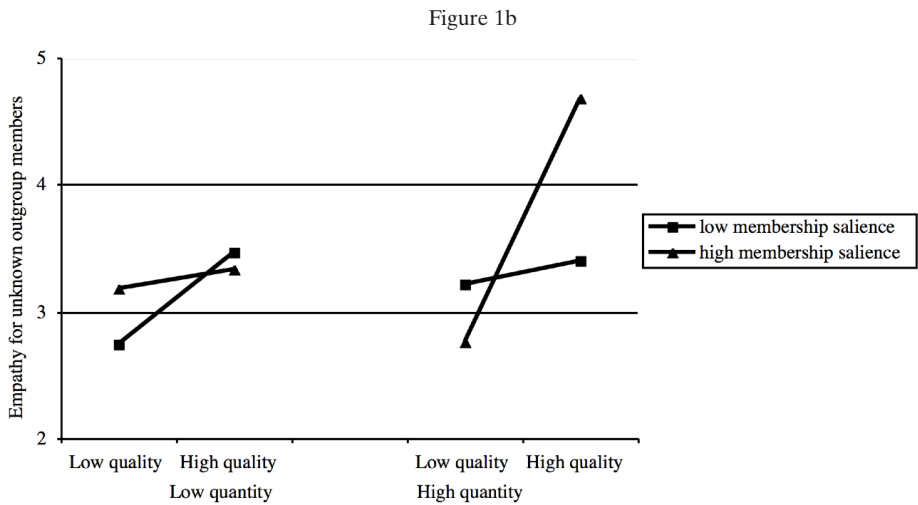
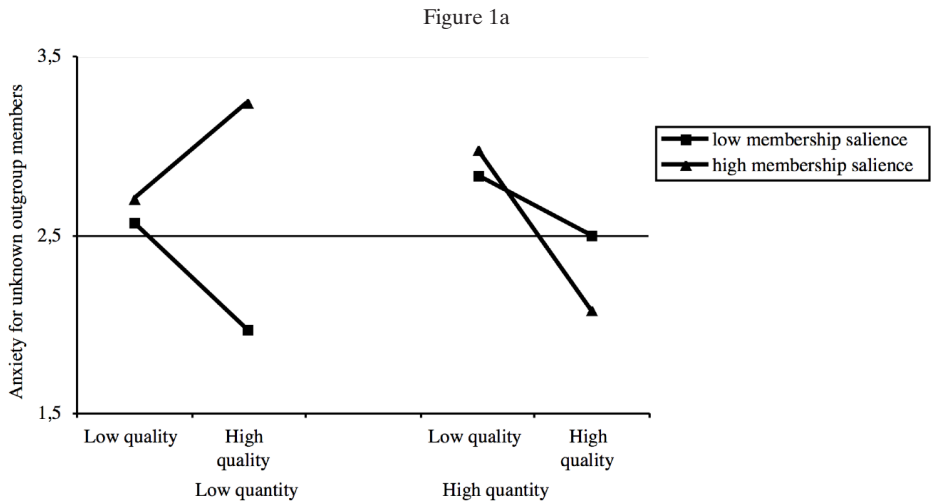
Table 2(b) - Hierarchical regression evaluating the moderating effect of membership salience on the relation between quantity and quality of contact and dependent variables (standardized regression coefficients)

	Dependent variables							
	Anxiety		Empathy		Outgroup evaluation		Implicit outgroup evaluation	Implicit ingroup bias
	Known	Unknown	Known	Unknown	Known	Unknown	Unknown	Unknown
<i>Step 3</i>								
A Quantity	-.00	-.01	.30*	.13	.24*	.10	.03	-.03
B Quality	-.36**	-.20	.36**	.29*	.42***	.36**	.15	-.27*
C Membership salience	-.14	.18	.01	.11	-.14	-.00	.32**	-.31*
A × B	-.05	-.19	.07	.12	.01	-.01	.46***	-.37**
A × C	.04	-.28*	-.03	.05	-.05	.03	.19	-.12
B × C	-.20	.09	-.03	.11	-.20	-.08	.15	-.02
A × B × C	-.23	-.33*	-.14	.27 <sup>†</sup>	.02	-.02	.00	.04
<i>R</i> <sup>2</sup>	.29	.22	.33	.24	.34	.17	.29	.27
<i>F</i>	3.82**	2.72*	4.60***	2.99**	4.90***	1.92	3.89***	3.42**
<i>df</i>	(7, 66)	(7, 66)	(7, 66)	(7, 66)	(7, 66)	(7, 66)	(7, 66)	(7, 66)
<i>F</i> <sub>ch</sub>	2.76	5.28*	1.12	3.67 <sup>†</sup>	.02	.03	.00	.06
<i>df</i>	(1, 66)	(1, 66)	(1, 66)	(1, 66)	(1, 66)	(1, 66)	(1, 66)	(1, 66)

Note: Quantity = quantity of contact; quality = quality of contact; membership salience = group salience during contact. For the dependent variables, higher ratings mean: stronger emotions of anxiety and empathy toward the outgroup, higher explicit and implicit outgroup evaluation, implicit ingroup bias.  
<sup>†</sup> $p \leq .06$ . \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

(Step 3; Table 2b). Analysis of simple slopes revealed that quality of contact reduced anxiety toward unknown outgroup members only when quantity of contact and membership salience were high,  $b = -.64$ ,  $t = 2.88$ ,  $p < .01$ , whereas it had no effects in the remaining cases,  $t_s < 1.61$  (Figure 1a). Similarly, the decomposition of the interaction concerning empathy showed that quality of contact increased the feelings of empathy toward the general category of the disabled only for high levels of quantity of contact and membership salience,  $b = 1.35$ ,  $t = 3.75$ ,  $p < .001$ ; the effects of contact quality were unreliable in all the other cases,  $t_s < 1.21$  (Figure 1b).

Figure 1 - Interaction between quality of contact, quantity of contact, membership salience. Dependent variables: anxiety (Figure 1a) and empathy (Figure 1b) toward unknown outgroup members. High score, low score of quality of contact, quantity of contact and membership salience are intended at one standard deviation above and one standard deviation below the respective mean)



*GNAT*. As can be observed in Table 2a (Step 1), both quality of contact and membership salience reduced implicit ingroup bias. At Step 2, a significant Quantity  $\times$  Quality interaction was found for the measures of implicit outgroup evaluation and implicit ingroup bias. Concerning the implicit outgroup evaluation, the decomposition of the effect revealed that quality of contact improved the implicit evaluation of the disabled only when quantity of contact was high,  $b = 1.05, t = 4.01, p < .001$ ; interestingly, contact quality tended to worsen outgroup evaluation when quantity of contact was low,  $b = -.52, t = 1.71, p < .10$ . Similarly, the analysis of simple slopes showed that favoritism for the ingroup was reduced by quality of contact only for high levels of contact quantity,  $b = -1.47, t = 4.12, p < .001$ ; the effects of contact quality were nonsignificant when quantity of contact was low,  $b = .22, t < 1$ . Contrary to Hypothesis 3, the three-way interaction was never significant,  $t_s < 1$  (Step 3). However, membership salience positively affected implicit outgroup evaluation and reduced implicit bias.

## 8. Discussion

We carried out a field study to test the intergroup contact theory (Brown & Hewstone, 2005), in the context of the relationship between the non-disabled and psychiatric disabled; we were also interested in the practical implications of results, which can be used for ameliorating intergroup relationships and improving employees' well-being. In line with our first hypothesis, frequent contact and cooperative contact positively influenced the relations with disabled colleagues, by increasing empathy toward them and enhancing their evaluation. These results are consistent with large part of contact research, indicating that contact under optimal conditions has positive effects on intergroup attitudes and emotions toward outgroup members actually encountered (Pettigrew & Tropp, 2006). The finding that cooperative contact reduced anxiety toward known outgroup members only when group salience was high replicates previous research (Harwood, Hewstone, Paolini, & Voci, 2005) and is consistent with the intergroup contact theory (Brown & Hewstone, 2005). The present results also add to the scarce literature on contact between non-disabled and disabled colleagues within the workplace (see Mangili *et al.*, 2004), by suggesting that positive contact experiences between employees may help create more positive relations at work.

In our second hypothesis, we predicted that contact effects would generalize to the outgroup as a whole only for high levels of membership salience. Consistently, we found that cooperative contact increased empathy and reduced anxiety for the disabled in general only when it was frequent and group distinctions during encounters were salient. These findings fully support the intergroup contact theory (Brown & Hewstone, 2005):

they provide strong evidence for the moderator role of membership salience with respect to intergroup emotions (Voci & Hewstone, 2003), and suggest that group salience is a crucial factor in the generalization of contact effects. The fact that quality of contact, independently from membership salience, was sufficient to improve the evaluation of the disabled in general, is in line with previous research, indicating that the positive effects of contact on intergroup attitudes are not limited to the type of disability defining known outgroup members and to the specific contact setting (Hetu *et al.*, 1994; Newberry & Parish, 1987; Pettigrew & Tropp, 2006). Moreover, probably, all participants were to some degree aware of group distinctions during contact for generalization to be achieved (Rothbart & John, 1985).

Concerning implicit attitudes, findings did not support Hypothesis 3. The three-way interaction between quality, quantity and membership salience, was never significant; instead, we found a significant interaction between quality and quantity, and a main effect of membership salience. Thus, cooperative contact improved implicit outgroup evaluation and reduced implicit bias, only when it was a repeated experience; for awareness of categorical distinction during contact, it was *per se* capable of improving the automatic evaluations.

Results relative to quality and quantity of contact are in line with research examining the relationship between contact and implicit prejudice: in fact, also Aberson and Haag (2007) found that reduction in implicit in-group bias is a function of the interaction between quality and quantity. This interaction is also consistent with an environmental interpretation (Bornstein, 1989; Zajonc, 1968), suggesting that repeated pairing of an attitude object with positive stimuli (frequent experiences of cooperation at work) reduces implicit prejudice. Furthermore, the multiplicative effect of quality and quantity is in line with dual-process theories. The APE model (Gawronski & Bodenhausen, 2006), for instance, suggests that implicit attitude change may stem from changes in the mental associative structure concerning a target object. In our study, frequent and cooperative contact with disabled colleagues was likely to reduce implicit prejudice by creating novel associations between the disabled category and positive attributes. But why the creation of these new associations was not qualified by membership salience? In other words, how is it possible that these new associations could be formed even when categorical belonging of exemplars was not salient? The answer, we suspect, may lie in category automatic activation, when category exemplars are encountered. This activation can vary in strength according to individual beliefs and temporary goals (see Macrae & Bodenhausen, 2001), and, importantly, may affect cognitive processes independently from conscious evaluations of membership salience. A challenge for future research, concerning implicit prejudice change, will be to test the intergroup contact theory (Brown & Hewstone, 2005), by using the degree



of spontaneous activation of category membership when category exemplars are met as a moderator of contact effects.

Also the main effect of the deliberate evaluations of membership salience can be explained making reference to the APE model (Gawronski & Bodenhausen, 2006). In fact, according to this model, implicit attitude change can also result from changes in pattern activation, that is, changes in the particular set of associations activated in memory, when category exemplars are met. In our case, it is possible that salience of disabled category in favorable settings activated the associations between the disabled and positive concepts and inhibited the activation of associations between the disabled and negative concepts. Other studies found that increased membership salience was sufficient to change implicit attitudes (e.g., Kühnen, Schiebl, Bauer, Paulig, Pöhlmann, & Schmidhals, 2001; Richeson & Ambady, 2003; Steele & Ambady, 2006), this change being in a positive direction if stimuli were presented in a positive rather than negative context (e.g., Wittenbrink, Judd, & Park, 2001).

Thus, for explicit evaluations our results strongly support the intergroup contact theory (Brown & Hewstone, 2005); they also point to the importance of considering implicit attitudes. In fact, although overt expressions of prejudice toward stigmatized groups have declined over the past decades, more subtle and indirect forms of rejection are still operating and, to the extent that often they cannot be easily detected, they constitute a strong barrier to the integration of these groups (Gaertner & Dovidio, 2005; Pettigrew & Meertens, 1995). This consideration is supported by our findings, which showed that, although participants expressed favorable evaluations of the disabled on self-reports, they also displayed a strong implicit bias. Thus, focusing only on explicit attitudes is not sufficient for a full understanding of the complex dynamics characterizing intergroup relations; instead, attention should be devoted also to implicit attitudes, especially when considering relationships with groups for which there are strong social pressures for a positive evaluation, such as the disabled (Feinberg, 1967; Devine *et al.*, 2001; Wong *et al.*, 2004).

The present research has important practical implications. Our findings demonstrate that cooperating at work, in a positive atmosphere, improves the relations with the disabled within the workplace and in wider society. In addition, making salient group distinctions during contact facilitates generalization of contact effects to the disabled as a whole. Contact and salience of group memberships have deep effects that are also useful for reducing implicit prejudice toward the general outgroup. Implicit attitudes are predictive of a wide range of outcomes measures, such as evaluations, physiological responses, social behaviors (Greenwald, Poehlman, Uhlmann, & Banaji, 2009), and are especially associated with less controlled forms of behaviors (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Gawronski & Bodenhausen, 2007).

The present research has, however, some limitations. First, data are correlational. However, we can be confident in the proposed causal sequence: our participants had no possibility to avoid contact, because the disabled were colleagues who met in the workplace, so it is more likely that contact reduced prejudice rather than the other way around. In addition, there is evidence that contact has longitudinal effects on intergroup attitudes and emotions (e.g., Vezzali, Giovannini, & Capozza, 2010). Second, our results are limited to the effects of contact with the disabled with psychiatric problems. It is possible that contact with other types of disabilities, such as physical disabilities, would produce different consequences, both within and outside the contact situation. In addition, although we tested generalization of contact effects to the whole disabled category, participants might have been thinking about their most accessible disabled category, that is, psychiatric patients. One more limitation is that we did not assess implicit attitudes toward disabled colleagues. Finally, it would be interesting to test whether contact is beneficial also from the point of view of the disabled. In conclusion, our results highlight the importance of considering contact, in some optimal conditions, so as to plan interventions, which can contribute to the integration of the disabled in the workplace and in the society as a whole.

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## Appendix

## Correlations between variables

	1	2	3	4	5	6	7	8	9	10	11
1. Quantity of contact	–										
2. Quality of contact	.29*	–									
3. Membership salience	.20	-.19	–								
4. Anxiety toward known outgroup members	-.03	-.40***	.07	–							
5. Empathy toward known outgroup members	.46***	.44***	.03	-.26*	–						
6. Evaluation of known outgroup members	.36**	.51***	-.11	-.32**	.51***	–					
7. Anxiety toward unknown outgroup members	.05	-.29*	.24*	.61***	-.12	-.20	–				
8. Empathy toward unknown outgroup members	.14	.38***	-.03	-.34**	.52***	.18	-.31**	–			
9. Evaluation of unknown outgroup members	.23†	.38***	-.01	-.27*	.35**	.51***	-.36**	.34**	–		
10. Implicit outgroup evaluation	.13	.18	.18	-.16	.16	.22	-.09	.24*	.30**	–	
11. Implicit ingroup bias	-.19	-.28*	-.22	.23†	-.24*	-.32**	.15	-.26*	-.35**	-.85***	–

† $p < .06$ . \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p \leq .001$ .



# Influence of position of the context sensitive graphemes and word frequency effect on reading speed: a performance analysis of developmental dyslexics and fluent readers

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## Abstract

*Several studies have reported how the presence of contextual letter-sound conversion rules influences both reading speed and accuracy and the effect of rule complexity holds for low frequency words only. We aimed to investigate the role of orthography complexity and, in particular, of context sensitive graphemes position and frequency of use on reading speed, analyzing the performance of developmental dyslexics and fluent readers. With regard to speed (reading speed of word lists), context sensitive graphemes position had an effect only for dyslexic children, who showed the worst performance if the context sensitive graphemes were in first position, regardless of word frequency. On the other hand, we found a frequency effect (in particular worst performance in the case of low frequency words) for both groups.*

**Keywords:** Developmental dyslexics, Word frequency, Reading speed

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## 1. Introduction

In languages with shallow orthography, such as Italian and German, the majority of letters have only one pronunciation and words like *suppellettile* [furnishing] may be read through letter-sound conversion rules in a one-to-one, left to right, fashion (Barca, Burani, Di Filippo, & Zoccolotti, 2006; Barca, Ellis, & Burani, 2007).

Despite the apparent transparency of the Italian language, we translate some graphemes into different sounds depending on adjacent letters. The letter *c* is pronounced /k/ when followed by a consonant or vowels *a*, *o*, *u*, as in the words *crudo* [raw], *capra* [goat], *colore* [colour] and *cucina* [kitchen]. Equally, when *c* is followed by *h*, it is pronounced /k/, as in *chiesa* [church]. However, it takes the sound /tʃ/ when followed by the vowels *e* and *i*, as in *cesto* [basket] or *cibo* [food]. A similar rule applies to the letter *g*, whose pronunciation also changes depending on successive letter, as in: *gatto* [cat], *ghianda* [acorn] and *gelato* [ice-cream]. In addition, there are some cases wherein the pronunciation of certain orthographic groups is not dependent upon the combining of different sounds - as in the *gli* group, pronounced differently in *aglio* [garlic] or *glicine* [wistaria]. So, we can say that some words contain *context sensitive graphemes*, which are groups containing letters whose pronunciation changes in response to the letter that follows (Lepschy & Lepschy, 1991; Burani, Marcolini, & Stella, 2002; Barca, 2003; Burani, Barca, & Ellis, 2006; Barca *et al.*, 2007).

Several studies have highlighted the relative influence of not only the complexity of spelling, but also word frequency of the given linguistic stimulus. Seidenberg, Waters, Barnes, and Tanenhaus (1984) estimated that, individuals spend more time reading words that contain context sensitive graphemes rather than with more transparent spelling patterns, especially if these words are low frequency of use. In this regard, for high frequency use words, there wouldn't be differences between reading speed words that contain context sensitive graphemes and words that do not contain (Taraban & McClelland, 1987; Paap, Chen, & Noel, 1987; Paap & Noel, 1991; Burani *et al.*, 2006; Barca *et al.*, 2007).

Barca *et al.* (2007) gave to read normal-reading third and fifth grade children words characterized by a simple grapheme-phoneme conversion system (e.g., *mondo* [world]) and words characterized by what the authors define as *contextual letter-sound conversion rules*, or rather less predictable letter-sound conversion rules (e.g., *cane* [dog]). In the first experiment, both groups of subjects (third and fifth graders) were slower and less accurate in reading words containing context sensitive graphemes. Younger children were slower and less accurate than older children but the effect of rule contextuality was similar in the two groups in terms of both reading time and accuracy. However, the second experiment showed that, for both groups of children, the effect of orthographic complexity was significant (for accuracy and speed) for low frequency words only.

Comparing fluent readers and dyslexic children, Barca *et al.* (2006) discovered that, although dyslexics were slower and less accurate than controls, they were affected by word frequency, grapheme contextuality and their interaction in a similar manner as average readers. Specifically, word frequency effects were found in both groups, with high frequency words named faster and more accurately and dyslexics showing greater, not smaller, frequency effects. Contextuality, effects were also apparent for both groups: words containing contextual graphemes were named more slowly and less accurately than words with one-to-one mappings. For both groups, this difference was present only in the case of low frequency words. According to the authors, these results showed the use of lexical reading in Italian dyslexics and refute the claim of a deficit in whole-word processing (Wimmer, 1993; Zoccolotti, De Luca, Di Pace, Judica, Orlandi, & Spinelli, 1999).

These results were interpreted in the framework of the DRC - Dual Route Cascaded Model (Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001) that assumes the existence of two different ways in the reading process: lexical (decoding the entire word) and non-lexical (conversion from grapheme to phoneme). The lexical route operates by accessing the whole-word, as in the case of high frequency words. On the other hand, the non lexical route operates serially by left to right letter-to-sound conversion rules. Words with context sensitive graphemes are read correctly only by the lexical route, but with dependence on word frequency. In fact, the lexical route guides to correct and rapid pronunciation in case of high frequency words. The non-lexical processing interferes in the case of low frequency or unknown words. Processing an unknown letter sequence incorporating context-sensitive graphemes could provoke mistakes about the correct reading of the irregular group (for example: /tza/ as /ka/).

In this respect, visual-lexical information (the global recognition of the word or group of context sensitive graphemes) is an important clue in bringing the subject to correct reading, both in typical (fluent readers) and atypical development (developmental dyslexics).

Here, we address the question of what may be the role of the position of the context sensitive grapheme within the word and word frequency influence on reading speed. Several studies (Sheerer, 1987; Coltheart & Rastle, 1994; Rastle & Coltheart, 1999; Mulatti & Job, 2003) showed that the effect of regularity is modulated by the context sensitive grapheme position in the word: the cost of irregularity decreases from the first to the last position in the word. Mulatti and Job (2003) analyzed the effect of phonetic regularity and irregularity in Italian college students, looking at regular (*fard*) and irregular (*photo*) foreign words. They hypothesized that, in naming time, the impact of the irregular morpheme would decrease according to its position in the word, from the first to the last (*photo*, *tour*, *free*, *saloon*, *buffet*). Based on the DRC (Coltheart *et al.*, 2001), Mulatti and Job (2003) forecast an interference between the two ways in reading irregular words and a modulation of this effect

depending on the position of the irregularity in the word. The results showed that the cost of irregularity decreased over the five positions tested.

Other studies showed that the time needed to read a nonword (derived from a word by changing a letter) depends upon the position of the diverging letter: first letter diverging nonwords (bunto derived from punto/point) were read more slowly than fourth letter diverging nonwords (monso, derived from mondo/ world). The impact of lexical activation on sublexical processing would modulate this effect also depending on the level literacy of the observers (Mulatti, Peressotti, & Job, 2007; Peressotti, Mulatti, & Job, 2010).

## 2. Aims and Hypothesis

In the present study, we used Italian words considering the number of syllables (*ba-si-li-sco* [basil]), not that of letters. The objective was to assess the effect of the presence of context sensitive graphemes (e.g., *sca-te-na-to* [wild]) and their position within the target word (first position vs. last position: *sco-lo-pen-dra* [centipede] vs *ba-si-li-sco* [basil]) in relation to the word frequency (high vs. low: *sca-te-na-to* [wild] vs *sco-lo-pen-dra* [centipede]) on reading speed (reading speed of word lists).

Since low frequency words tend to activate a non-lexical procedure, we hypothesized that both controls and dyslexic children would show worse performance in reading speed (reading speed of word lists) in the case of low frequency words. Furthermore, both groups should be influenced by the context sensitive grapheme position with lower reading speed with context sensitive graphemes in first position (especially in the case of low frequency words).

## 3. Method

### 3.1 Participants

Forty eight children participated to the study (24 males and 24 females). Of these, 24 were developmental dyslexics (12 males and 12 females) and 24 fluent readers (12 males and 12 females), attending the third grade of two state-run elementary schools in Palermo. The participants were aged between 7 years and 7 months (91 months) and 8 years and 6 months (102 months), average = 96.8,  $SD = 2.86$ . Children were selected from a sample of 200 children (see below).

### 3.2 Materials and Procedure

#### *Screening procedures*

At the beginning of the study, a screening was done on all third graders from two public schools located in a medium-high socio-economic district. The screening was carried out over a period of three months.

First, each child was given a sociological evaluation form to ensure that no socio-cultural disadvantage might interfere with reading ability. In particular, we included in our sample only children whose both parents had completed at least high school.

Children were tested on a whole battery of reading and spelling tests commonly used in the assessment of reading disability in Italy. This battery included the Non-Verbal Intelligence Test (TNIV; Hammill, Pearson, & Wiederholt, 1998), the MT Text Comprehension and Decoding Test (Cornoldi, Colpo, & Gruppo M.T., 1998) and the Dyslexic and Dysgraphic Evaluation Test (Sartori, Job, & Tressoldi, 1995).

The Non-Verbal Intelligence Test (Hammill, Pearson, & Wiederholt, 1998) is particularly suited for children with language and reading disabilities because it evaluates the development of logical thinking limiting the influence of cultural and linguistic aspects. It consists of 150 items, subdivided into three areas of logical operations: analogies, categories and sequences. Each area includes tasks of object illustration and geometric picture. For each item, evaluation was binary, with a mark of 1 attributed to each correct item, and 0 to incorrect items. The raw data obtained were transformed into a measure of mental age on the basis of conversion tables. The average intelligence was 100 with standard deviation 15. The reliability coefficient of the test was  $\alpha = .90$ . Moreover, this test presents good validity since the correlation with the Wechsler Intelligence Scale for Children is .81.

In the MT test (Cornoldi *et al.*, 1998), the first story is suited to and standardized for the children's school grade, followed by 10 multiple choice questions relating to the characters and events mentioned in the story. Participants were asked to choose the correct response based on their understanding of the story. Scoring comprised 1 point for each correct response. Normal performance is five or more correct choices. This test was administered to select students with normal reading comprehension abilities. The reliability coefficient of the test is  $\alpha = .60$  (Cornoldi *et al.*, 1998). The Decoding reading test (Cornoldi *et al.*, 1998) required the subjects to read a text aloud. The number and type of errors made were evaluated. Separate scores were calculated for speed and accuracy. With regard to accuracy, a score of 1 was attributed for each long pause, or addition or omission of syllables, words, or lines. A score of 0.5 was attributed for each stress error, hesitation, or self-correction. Normal performance is 6 or less errors. With regard to speed, the total score was obtained by calculating the seconds per number of syllables of text read. Normal performance was a score of .80 s/syllable or less. This test was administered to identify participants with reading decoding difficulties. The reliability coefficient of test is  $\alpha = .75$  for accuracy and  $\alpha = .64$  for speed (Cornoldi *et al.*, 1998).

Finally, the Battery for the Assessment of Developmental Reading and Spelling Disorders (Sartori *et al.*, 1995) consisted of 12 sub-tasks. Here, accuracy and speed were evaluated for the grapheme and number reading,

grapheme comparison, lexical decision and word and nonword reading tasks. Accuracy was evaluated for each task with a score of 1 being attributed to each correct item, and 0 to incorrect items. The raw data thus obtained were then compared to the appropriate conversion tables. Performance under the 5<sup>th</sup> percentile indicated reading disability. The test-retest reliability of the battery was  $r = .56$  for accuracy and  $r = .77$  for speed.

The battery for the Assessment of Developmental Reading and Spelling Disorder were not fully administered: task 4 (reading lists of words aloud), task 5 (reading lists of non-words aloud), task 7 (recognition of non-homograph homophones) and task 8 (detection of fusion and separation of words errors within sentences) were administered only to the readers with disabilities decoding, to ascertain, more precisely, the types of difficulties encountered during the deciphering of the text.

With regard to normative criteria, we selected children who achieved scores in the middle range (between 85 and 115) on the TINV, made at least seven errors in the correctness test (MT), achieved at least .81 s/syllable in the MT test and responded to at least seven correct responses out of 10 in the MT comprehension test. Then, four tasks (4, 5, 7 e 8) of the Battery for the Assessment of Developmental Reading and Spelling Disorders (Sartori *et al.*, 1995) were administered to all children who had a defective performance in Correctness and Speed at the MT tests (seven errors or more for Correctness test and .81 s/syllable or more for Speed test). We included in our sample, therefore, only those children who, in these tasks (4, 5, 7 and 8) reported scores lower than the 5th percentile.

With regard to fluent readers, we selected children who achieved scores in the middle range (between 85 and 115) on the TINV, made less than seven errors in the correctness test (MT), achieved less than .81 s/syllable in speed test (MT) and responded to at least seven correct responses out of 10 in the Comprehension test (MT).

### *Experimental test*

Sixty four-syllable words were selected (20 nouns, 20 verbs and 20 adjectives). Half (30) were of high frequency: 10 had context sensitive graphemes (*c* or *sc*) in the first position (e.g., *scivolare* [to slide]), 10 in the final position (e.g., *solletico* [tickling]) and 10 were fillers words, characterized by the absence of context sensitive graphemes. The other half (30) were of low frequency: 10 had context sensitive graphemes (*c* or *sc*) in the first position (e.g., *conspirare* [to conspire]), 10 in the final position (e.g., *odalisca* [odalisque]) and 10 were fillers words, characterized by the absence of context sensitive graphemes. In total, we constructed four lists, each consisting of 15 words - 10 target and 5 filler words: the first list consisted of 15 high frequency words with context sensitive graphemes in the final position; the second list consisted of 15 high frequency words with context sensitive graphemes in the first position; the third of 15 low frequency words with

context sensitive graphemes in the final position; and the fourth list of 15 low frequency words with context sensitive graphemes in the first position.

The 60 target words were selected based on the Dictionary of Basic Italian (D.I.B.; De Mauro & Moroni, 2000), a specific Italian dictionary for children from 8 to 11 years: 30 words were defined as either basic, strategic or of high frequency use; the other 30 were of a lesser use (i.e., in the D.I.B., they are not part of the groups of basic, strategic and high frequency use words).

The children were called out of the class during regular class hours and were accompanied to the place set up for testing (away from other activities within the school). During this period, children read the four lists of words for a total of 60 words. We balanced the administration of the four lists among participants according to a *latin square* design: the first child read the lists in the order 1, 2, 3 and 4; the second in the order 2, 3, 4 and 1; the third in the order 3, 4, 1 and 2 and so on.

#### 4. Results

First, we conducted t tests to assess the effects of context sensitive graphemes position (first vs. last position) and word frequency (high vs. low) on reading speed. There were significant differences in developmental dyslexics' speed of reading in terms of the position of the context sensitive graphemes ( $t(23) = 4.98, p < .001$ ), with lower performance if the context sensitive graphemes were in the first ( $M = 99.46$  s) than in the last position ( $M = 87.21$  s, see Table 1). We also found significant differences regarding the word frequency ( $t(23) = -7.44, p < .001$ ), with lower performance when the target words were of a low ( $M = 105.67$  seconds) than high frequency ( $M = 81$  s, see Table 1). On the other hand, fluent readers revealed no significant difference in reading speed as a function of the position of the context sensitive graphemes. Significant differences arose concerning word frequency ( $t(23) = -10.9, p < .001$ ), with lower performance if the target words were of low ( $M = 57.62$  s) rather than high frequency ( $M = 30.5$  s, see Table 1).

Table 1 - *Effect of the position of the context sensitive grapheme on speed (reading lists of words) and effect of word frequency on speed (reading speed of words) in Dyslexics Fluent readers: average speed in seconds (Av.) and standard deviation (Sd.)*

	1 <sup>st</sup> Position		Last Position		A.f.d.		B.f.d.	
	Av.	Sd.	Av.	Sd.	Av.	Sd.	Av.	Sd.
Dyslexics	99.46	30.29	87.21	24.16	81	28	105.67	27.81
Fluent readers	44.5	12.46	43.62	10.29	30.5	9.53	57.62	15.08

The analysis within groups showed significant differences in reading speed for developmental dyslexics as a function of the position of the context sensitive graphemes for both high and low frequency words: in the case of high frequency, there was lower performance for words with context sensitive graphemes in first ( $M = 42.42$  seconds) than in last position ( $M = 38.58$  seconds;  $t(23) = 2.47, p = .022$ ); similarly, in the case of low frequency, there was lower performance for context sensitive graphemes in first ( $M = 57.04$  s) than last position ( $M = 48.63$  s;  $t(23) = 3.95, p = .001$ ). As to the effect of frequency, ( $t(23) = -6.47, p < .001$ ) there was lower performance low frequency ( $M = 57.04$  s) than high frequency words ( $M = 42.42$  s) for stimuli with context sensitive graphemes in first position ( $t(23) = -6.47, p < .001$ ); similarly for stimuli with context sensitive graphemes in last position there was lower performance for low ( $M = 48.63$  s) than high frequency ( $M = 38.58$  s) words ( $t(23) = -4.83, p < .001$ ).

Table 2 - *Effect of the position of the context sensitive grapheme and word frequency on speed (reading speed of words): average speed in seconds (Av.) and standard deviation (Sd.)*

	1 <sup>st</sup> Position		Last Position		1 <sup>st</sup> Position		Last Position	
	A.f.d.		A.f.d.		B.f.d.		B.f.d.	
	Av.	Sd.	Av.	Sd.	Av.	Sd.	Av.	Sd.
Dyslexics	42.42	15.1	38.58	13.89	57.04	17.08	48.63	12.27
Fluent readers	15.45	5.13	15.04	4.58	29.04	8.58	28.58	7.28

With respect to fluent readers, differences were observed only for frequency (but not position) with lower performance for low ( $M = 29.04$  s) than high frequency words ( $M = 15.46$  s) in the case of stimuli with context sensitive graphemes in first position ( $t(23) = -9.95, p < .001$ ) as well as in the case of stimuli with context sensitive graphemes in last position ( $t(23) = -10.21, p < .001$ ); low frequency words:  $M = 28.58$  s; high frequency words:  $M = 15.04$  s). Results are presented in Table 2.

## 5. Discussion

The lexical route operates in parallel and quickly, while the non lexical route works serially from left to right. According to Mulatti and Job (2003), this diversity is the basis for explaining the irregularity position effect. They argue that, if the irregular grapheme is at the end of the word, when the



non-lexical route begins to process, the lexical route has already processed the whole word. The interference between the two ways would be minimal and there would not be delays in naming. By contrast, if the irregular grapheme is in the first position, the two ways compete for the selection of the critical group and naming time would increase (Mulatti & Job, 2003).

In the present study, we selected high- and low-frequency Italian words and considered a division into syllabic groups, selecting less transparent syllabic groups, located in either the first or last position. In fact, several studies showed that the effect is present only for low frequency words. The presence of contextual sensitive graphemes would not affect the reading of high frequency words because the lexical procedure allows for immediate word recognition. On the other hand, the processing of low frequency words is slowed by the competing phonemes activated in the non-lexical route by the context sensitive graphemes (Barca *et al.*, 2006; Burani *et al.*, 2006; Barca *et al.*, 2007). However, it might be the case that the dependent variable used in our study (list reading time) is less sensitive with respect to the measure used in previous studies (voice onset reaction time for single words).

In the present study, when comparing context sensitive graphemes placed in first and last position, only dyslexic children showed significant differences with lower performance if the context sensitive graphemes were placed in first position (independent of frequency). Contrary to our hypothesis, no significant difference appeared for fluent readers comparing context sensitive graphemes placed in first and in last position. The only case in which a significant difference emerged was comparing low and high frequency words (with worse performance for the latter). Probably, for fluent readers, in the case of high frequency words, there is a quick recognition of the whole word or, in the case of low frequency words, there may be an effective identification of the critical syllabic group and its position may not be so important. It should also be added that the more familiar Italian word structure (compared to that of foreign languages such as English) may have contributed to the good performance of fluent readers (Mulatti & Job, 2003).

According to DRC model (Coltheart *et al.*, 2001), there would be an interference between the two ways in reading irregular words (with context sensitive graphemes) and a modulation of this effect depending on the position of the irregularity in the word (Mulatti & Job, 2003). Lexical route would guide to a good pronunciation, particularly for high frequency words.

Furthermore, although also dyslexic children tend to activate a lexical procedure in the case of high frequency words, slower performance emerged when the context sensitive graphemes were in first position not only in the case of low frequency words but also in the case of high frequency words. This findings shows that, for dyslexic children, before the activation of one of two ways and beyond which way is activated (lexical or non lexical), the context sensitive graphemes in first position, would create a slowdown in time designation. This would be even in the case of high fre-

quency words, demonstrating a specific difficulty not only in decoding complex words but also in global recognition of familiar words.

The linguistic analysis that emerges from this research offers some interesting clues and innovative features in a research area that increasingly stresses the importance of words being split in the decoding process into syllables (sca) or group of letters (sc), over and above the role of the lexical and non-lexical routes (Traficante, Barca, & Burani, 2004; Marcolini, Donato, Stella, & Burani, 2006; Barca, *et al.*, 2007; Burani, Marcolini, De Luca, & Zoccolotti, 2008; Zoccolotti, De Luca, Judica, & Spinelli, 2008). Particularly relevant is the demonstration of the influence of the context sensitive grapheme position on the fast decoding of developmental dyslexics. In a diagnostic and rehabilitation context, attention to the linguistic materials should allow a more accurate analysis of the various morpho-syntactic and orthographic characteristics that make some words more accessible than others, especially in the absence of an automatic decoding process.

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