BRIC Club Information Pack

Prosper
Project Australia

Thank you for your interest in Bric club!

BRIC is an acronym for **Building Resilience in Children**. BRIC club is a free initiative that can be run at your school to provide children who struggle to interact and communicate with others, access to play and social opportunities with other children. BRIC clubs help children to develop and reinforce play and social skills.

The program was initially developed by a team of NSW Ability Links providers and was piloted in more than 10 schools across Sydney's Inner West, Eastern suburbs, Sutherland and Campbelltown with great results by a group of community organisations. It has now been delivered in many schools across NSW with the support of coordinating agency, **Prosper (Project Australia)** and this information pack has been prepared to provide an overview of how you can bring BRIC club to your school.

BRIC Club resources have been funded by **Mary MacKillop Today**.

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BRIC Club FAQ

What is BRIC club?

BRIC stands for Building Resilience in Children. A BRIC Club is a free initiative that can be run at your school to provide children who struggle to interact and communicate with others, access to play and social opportunities with other children. BRIC clubs make use of block kits such as LEGO® or Meccano® to create structured play opportunities that help children to develop and reinforce play and social skills.

The idea is that students work in small teams during BRIC club sessions, across the course of a single school term, to build creations using block kits. At the end of each term the creations are deconstructed and the kits re-used with a new group of students.

Why BRIC club?

LEGO® play therapy activities are known to help children to improve their verbal and nonverbal communication, joint task focus, sharing and turn-taking, as well as their collaborative problem-solving skills. A useful scholarly article relating to LEGO® play therapy is included at the end of this pack.

BRIC clubs are a simple way of bringing this valuable form of play therapy into schools so that entire school communities can benefit. In piloting the program, facilitating schools worked with the project team to measure the results of running the BRIC club. School counsellors used the Strengths and Difficulties Questionnaire (SDQ) to conduct pre and post testing of participating students. The results of this testing showed decreases in anti -social behaviours (such as hyperactivity, conduct problems and peer problems) in participants, and subsequent increases in pro-social behaviours in the participating students.

Which students can participate in BRIC club?

BRIC club is great for all children but can be a particularly valuable opportunity to learn and play for children who struggle socially, or who have additional needs. We invite your school to nominate 18 children (mixed genders) from to participate. Piloted school groups worked with students from Stage 2, however the program is suitable for children of all ages.

Students are then grouped into 6 teams of three students per team. In each group of three, we ask that you include two children who might fall into any of the categories listed in the dot points below, as well as one student who is patient, kind and easy going (a steadying influence on the group).

- Children with autism spectrum disorders (they respond very well to the patterned, tactile elements of blocks/bricks).
- Children who are socially isolated/struggling to make friends.
- Children with ADD/ADHD and other learning disabilities.
- Children with poor communication skills.

Each time you run BRIC club across a school term you can select a new or different group of students.

Where do the kits come from?

Schools need to supply the block kits used in BRIC club. These can be LEGO®, Meccano® or other similar kits but should be age-appropriate for the group of students you are working with. Stage 2 students are a good fit for BRIC club.

Schools will need one kit per team of 3 students. Working with the recommended group size of 18 students, 6 kits would be needed to accommodate the 6 teams (3 students per team). The purchase of 6 kits will usually cost between $300 and $500.

Kits only need to be purchased once and can be re-used continuously as new students rotate through the program each term and year. Some block kit brands also offer kits that can be assembled into multiple creations and this is a good choice for a kit as it provides multiple creations to work on for student teams that may finish their initial creation faster than other teams.

If there are other schools in your region that are interested in BRIC club you may wish to partner with those schools in the purchase of kits that can then be used my multiple schools.

There are a number of options for schools seeking to fund the purchase of these kits. Five suggestions are outlined below;

1. Approach a local Target, Kmart, Big W or other retailer in your area about having them donate the kits.
2. Ask school families if they have unused kits they can pass onto the school.
3. Seek a donation of the funds from the school P & C Committee.
4. Request funding for the kits through your local CLUBS NSW Grant round. This involves completing a simple grant application form here www.clubgrants.com.au.
5. Approach your local Club or a local business and request a donation to cover the amount.
6. Host a fundraiser (Zooper Doopers, BBQ's, raffle or otherwise).

If you require additional assistance with this, contact **Prosper (Project Australia)** by emailing mail@prosperprojectaustralia.org.

If you no longer wish to run BRIC club at your school you can pass the kits on to another school in your area so that they can participate in the program.

What will BRIC club participants be doing?

Each team of 3 students should be seated at a table and provided with one kit per team.

Each student will be allocated a different role (which will be rotated every 10 minutes so that everyone gets to try each role):

- "The Supplier" who has control of all the block/brick pieces
- "The Architect" who has the instructions to build the model
- "The Builder" who is responsible for putting the model together

Detailed position descriptions are available in this information pack, for each role.

The students will then need to work together to assemble their model creations.

When does BRIC club run and how much time does it take?

Each BRIC club session takes approximately 40 minutes. That's 5 minutes to set up, 10 minute rotations of the three BRIC club roles, and 5 minutes to pack down. Utilising 40 minute sessions, it is anticipated that it will take between 6 and 9 weeks for each group to complete each kit, fitting in perfectly with school term length.

BRIC club runs once per week and schools choose the time and day that best suits them for running the club. It may be before or after school, at lunch time or in class time.

What commitment is required from school staff?

Ideally two or three teachers from each school will be supported in participating in an approximately 1.5 hour one-time BRIC club familiarisation session. However, as familiarisation resources are available for free download it is possible for any number of staff members to read through the resources. A BRIC club typically runs once per week (for approximately 40 minutes) across an entire school term and the program also requires that a teacher or staff member supervise each session.

What else do we need to do?

The only other requirement is for your school to provide a space to run the BRIC club sessions that is big enough to fit the children involved (classroom, library, hall or other) and a space to store the partially constructed kits in-between sessions.

Can we get support in delivering a BRIC club at our school?

Prosper (Project Australia) is available to provide information and answer questions about running the program at your school. Get in touch by emailing mail@prosperprojectaustralia.org.

How do I get BRIC club happening at my school?

It's easy! Download and read through the BRIC club resources from www.prosperprojectaustralia.org, speak to your school principal to get permission to start the program and away you go! If you have any questions, concerns or comments feel free to contact Prosper at any time.

Guide to Getting BRIC Club Started

Below is a checklist to help you get BRIC club happening at your school;

- ❏ Download and read through the BRIC club resources.
- ❏ Get the permission of your school principal to plan and run BRIC club.
- ❏ Source model kits to use for BRIC club (see above FAQ for assistance with this).
- ❏ Decide which school term you want to run BRIC club in. Start this planning in the term prior. BRIC club can take 8 - 10 weeks so allow a full term to run the program.
- ❏ Select a minimum of two teachers to participate in the project: one to lead BRIC club session and at least one to be back-up.
- ❏ Ensure these (minimum) two teachers familiarise themselves with BRIC club by reading through these resources.
- ❏ Seek additional support and/or orientation from Prosper (Project Australia) as required by emailing mail@prosperprojectaustralia.org.
- ❏ Select a time and venue/room where the club will operate. This should be a reasonably quite space where there will be minimal disruptions. A BRIC club session takes 40 minutes.
- ❏ Ensure you have a place to safely store the part-built kits in between sessions.
- ❏ Select up to 18 children to participate in groups of three.
- ❏ A smaller group is viable, but must be groups of three e.g. 12, 15 or 18 children.
- ❏ Each team of three will need 2 'target' children and one 'role model' (see FAQ for guidance).
- ❏ Send the BRIC Club invite home (with permission note) to the parents of slected children. Choose more children than you need to allow for drop-out. Place them on a wait list.
- ❏ Collect permission notes.
- ❏ Conduct an orientation with selected students using the student powerpoint presentation included in this resource pack.
- ❏ Work with participating students to establish group rules for your BRIC Club, For example, one person talking at a time.

You're all set to start!
Just remember the group is most effective when applying the principles of *Play Therapy* which include:

- Creating a dedicated time and space for the activity.
- Using non-verbal communication.
- Allowing some time during the session for group members to have free play time to encourage creativity and spontaneous interaction amongst the group.

BRIC CLUB

What is a BRIC Club?

- BRIC stands for **Building Resilience in Children**.
- A BRIC club is a free initiative that can be run at your school to provide children who struggle to interact and communicate with others, access to play and social opportunities with other children.
- BRIC clubs help children to develop and reinforce play and social skills, and emerging evidence shows good improvements in pro-social behaviours and a reduction in anti-social behaviours amongst participants.
- Initiative developed by Ability Links, taken over by Prosper (Project Australia).
- Has been run in over 40 schools across Greater Sydney and some regional areas.
- Support resource kit available.

Which students should participate?

Which students should participate?

- BRIC club is great for all children but can be a particularly valuable opportunity to learn and play for children who struggle socially, or who have additional needs.
- Nominating 18 children (mixed gender) from stage 2 is a recommended starting point.
- Suitable for any age group of students that can be meaningfully engaged with model kits.
- Students are then grouped into 6 teams of three students per team.
- In each group of three aim to include two children who might fall into any of the categories below as well as one student who is patient, kind and easy going (a steadying influence on the group).

- Children with autism spectrum disorders (they respond very well to the patterned, tactile elements of blocks/bricks)
- Children who are socially isolated / struggling to make friends
- Children with ADD/ADHD and other learning disabilities
- Children with poor communication skills

Each time you run BRIC club across a school term you can select a new or different group of students.

Logistics

- BRIC club runs once per week across a school term and schools choose the time and day that best suits them for running BRIC club. It may be before or after school, at lunch time or in class time.
- Each BRIC club session takes approximately 40 minutes. That's 5 minutes to set up, 10 minute rotations of the three BRIC club roles, and 5 minutes to pack down. Utilising 40 minute sessions, it is anticipated that it will take between 6 and 9 weeks for each group to complete each kit, fitting in perfectly with school term length.
- BRIC club can run with only one teacher but ideally two or three teachers will be familiar with BRIC club. The specific number of teachers required is dependent on the size of the group and the kids involved. You can also use parent helpers.
- If a student is away on a particular week the club can proceed with 2 members, alternatively you can allocate 'site manager' to leftover students to rotate support.
- LEGO®, Meccano® or other similar kits are used for BRIC club and can be sourced through local Club Grants, P & C fundraiser, or otherwise (see FAQ in resource kit for ideas).

What else is needed?

- Space to run the BRIC club sessions that is big enough to fit the children involved (classroom, library, hall or other) and to store the partially constructed kits in between sessions.
- Parent permission – sample note provided.

Getting Started

- Decide which term you want to run BRIC Club. Start this planning in the term prior if possible. BRIC Club can take 8 - 10 weeks so allow a full term.
- Select a minimum of two teachers to participate in the project: one to lead and at least one to be back-up.
- Arrange with the project team to receive orientation. That's what this is!
- Select a time and venue/room where the club will operate. A BRIC Club session takes 40 minutes.
- Ensure you have a place to safely store the part-built kits in between sessions.

Getting Started

- ✓ Select up to 18 children to participate in groups of three.
- A smaller group is viable, but must be groups of three e.g. 12, 15 or 18 children.
- Each team of three will need 2 ‘target’ children and one ‘role model’ (see FAQ in resource kit for guidance).
- ✓ Send the BRIC Club invite (with permission note) home to the parents of selected children. Choose more children than you need to allow for drop-out. Place them on a wait list.
- ✓ Collect permission notes.
- ✓ Organise model kits.
- ✓ Brief the participating children and other staff using the powerpoint presentation that follows. Ensure you set appropriate group rules for student in your BRIC club (for example, only one person talking at a time).

Getting Started

If you need any support or have any questions about BRIC Club please contact **Prosper (Project Australia)** on 0402 787 571 or mail@prosperprojectaustralia.org

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WELCOME TO YOUR BRIC CLUB

What is a BRIC Club?

- A **BRIC Club** is a time for you to come together with old friends and new friends to play and create!

BRIC Club Roles

The Architect

The Architect's role is to read the instructions and pass on directions to the Supplier and Builder. This means they will need to:

- Tell the Supplier which model kit pieces are needed and describe what each piece looks like.
- Support the Director to tell the Builder where each piece needs to go.
- Only the Architect and Director can see the instructions!

The Director

The Director's role is to make sure the team is working together and communicating with one another! The Director also works with the Architect! This means they will need to:

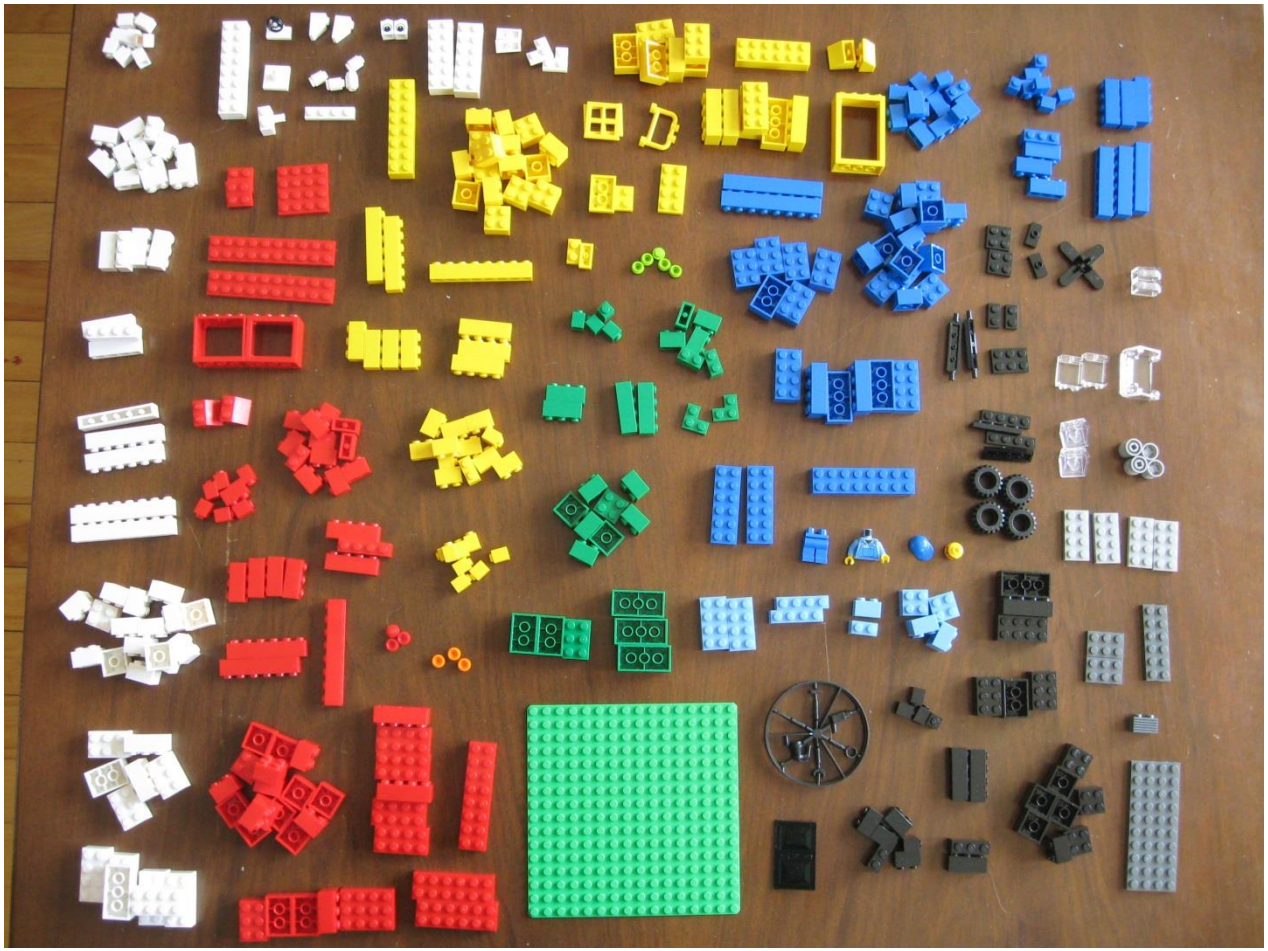
- Be aware of everyone's roles
- Ensure communication between roles
- Only the Architect and Director can see the instructions!
- Tell the Builder where each piece needs to go.

The Supplier

The Supplier controls all of the pieces of the model kit. This means that they will need to:

- Organise pieces into the same colour
- Listen to the Architect to find out which piece is needed
- Look through the model kit to find the correct piece
- Pass the correct piece to the Builder

The Supplier – example



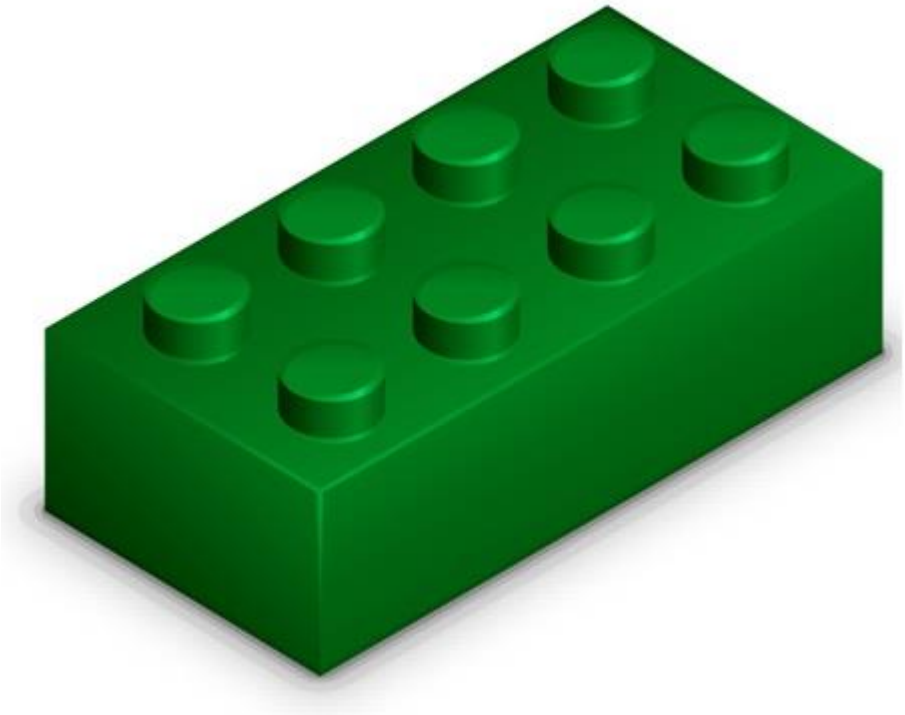
The Builder

The Builder's role is to put the model together! To do this, they will need to:

- Only use the pieces given to them by the Supplier
- Listen carefully to the instructions given to them from the Director/Architect
- Put the model together

Describing pieces

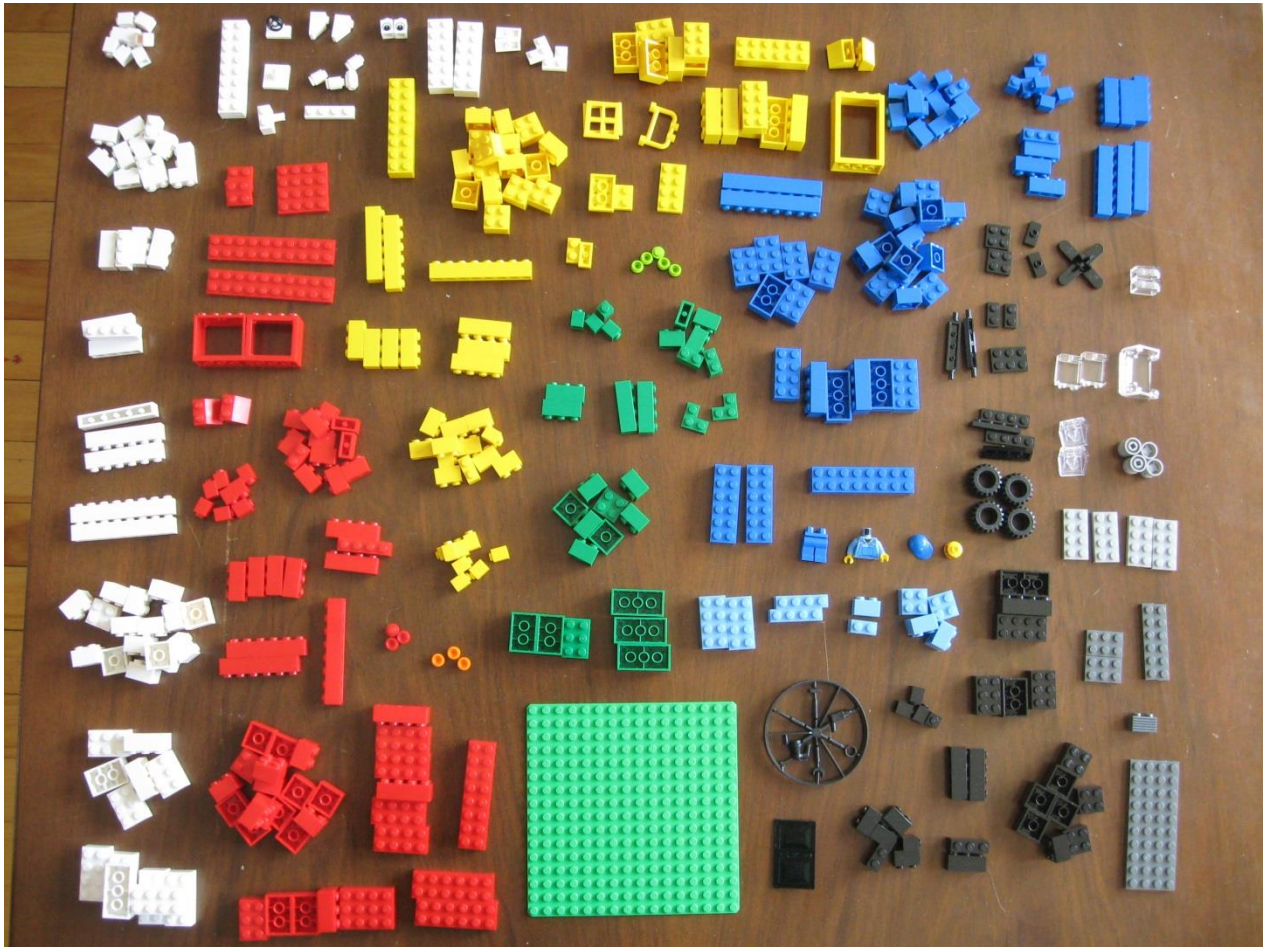
- What is the Colour?
- How many Dots ?
- What is the Shape?



Describing Pieces

Can you describe one of these pieces?

What is the **Colour**?
How many **Dots** ?
What is the *Shape*?



Reading Instructions

Architect says:
"Supplier please find 2 pieces that are :
- black colour
- two dots

Architect says:
"Supplier please find 2 pieces that are :
- black colour
- Triangle shape

Reading Instructions

Supplier
LOOKS for the pieces
"I've found them!"

Supplier
GIVES all the pieces to the
Builder

Reading Instructions

Architect says to the Builder:

"Please put the triangle piece on top of the flat piece."

What are this BRIC Club's Rules?

READY….

SET….

BUILD!

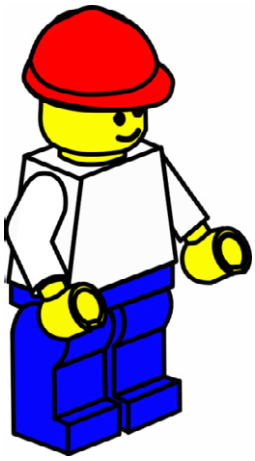
BRIC Club Play Programs for Schools

Your child is invited to join a BRIC Club hosted by the school.

When: _____

Where: _____

Staff responsible: _____



WHAT IS A BRIC CLUB?

A BRIC Club provides children with access to play and social opportunities with other children. BRIC Clubs help children to develop and reinforce play and social skills such as:

- Verbal and non-verbal communication
- Joint attention
- Task focus
- Sharing and turn-taking
- Collaborative problem-solving.

HOW BRIC CLUBS RUN

1. Groups of 3 students partake in structured play.
   Each allocated with one of the following roles:

   Architect
   The *Architect* is responsible for reading the instructions and telling the Supplier which model kit brick/block to use, and the Builder where to put the brick.

   Supplier
   The *Supplier* holds onto all the bricks and passes the bricks to the Builder.

   Builder
   The *Builder* follows instructions from the Architect and puts the bricks together.

2. The roles are swapped around during a BRIC Club session so that everyone gets to try something new.

3. BRIC Club meets weekly to work on the model together.

CERTIFICATE OF BRICKTACULAR EXCELLENCE!

This certificate is awarded to

.....

For being a fantastic team member of the School BRIC Club

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Use of LEGO© as a Therapeutic Medium for Improving Social Competence

Daniel B. LeGoff

A repeated-measures, waiting list control design was used to assess efficacy of a social skills intervention for autistic spectrum children focused on individual and group LEGO© play. The intervention combined aspects of behavior therapy, peer modeling and naturalistic communication strategies. Close interaction and joint attention to task play an important role in both group and individual therapy activities. The goal of treatment was to improve social competence (SC) which was construed as reflecting three components: (1) motivation to initiate social contact with peers; (2) ability to sustain interaction with peers for a period of time; and (3) overcoming autistic symptoms of aloofness and rigidity. Measures for the first two variables were based on observation of subjects in unstructured situations with peers; and the third variable was assessed using a structured rating scale, the SI subscale of the GARS. Results revealed significant improvement on all three measures at both 12 and 24 weeks with no evidence of gains during the waiting list period. No gender differences were found on outcome, and age of clients was not correlated with outcome. LEGO© play appears to be a particularly effective medium for social skills intervention, and other researchers and clinicians are encouraged to attempt replication of this work, as well as to explore use of LEGO© in other methodologies, or with different clinical populations.

KEY WORDS: Social skills; autism; group therapy; play.

INTRODUCTION

The particular social skills intervention described below evolved over time as a consequence of ongoing attempts to provide effective social skills therapy for a growing group of children diagnosed with autistic spectrum disorders. The resulting strategies reflect both my input, as a scientist practitioner, and the influence of an inspiring and persuasive group of children. The impetus for developing this intervention strategy was provided, first, by the scarcity of school-based social skills programs. As Klin and Volkmar (2000) have commented: "… The situation in the field is still quite frustrating for all those concerned." Second, the therapy approaches in use at the time seemed to the children to be difficult, irrelevant, and un-engaging. Other clinicians have noted that children in the autistic spectrum have difficulties with attending to social learning opportunities, and have little intrinsic motivation to learn these skills (e.g., Attwood, 1999), but there has been little published with regard to overcoming these deficits.

A third impetus for this approach was the fact that although many children with autistic disorders could learn to respond appropriately to social skills exercises in the therapy setting, and could demonstrate social behaviors when prompted by adults or peers in some settings, there was little generalization of skills from one setting to another, and a persisting absence of initiation of social interaction, especially with peers, including a failure to develop age–appropriate relationships. In other words, they could learn from social skills drills and exercises, and when prompted could produce the right

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0162-3257/04/1000-0557/0

behavior in the classroom, but they were not initiating contact or play on the playground, and they were not making friends.

Although there have been a number of published guidelines for social skills interventions for children with autism (Frea, 1995; Gray, 1994, 2000; Gray & Garand, 1993; Mesibov, 1984, 1992; Quill, 1995), few of these provide much empirical evidence of effectiveness (Ozonoff & Miller, 1995; Swaggart *et al.,* 1995). In addition, despite the work of a few clinical researchers describing different diagnostic groups and clinical features (Baron-Cohen, 1995; Schopler & Mesibov, 1986; 1992), there has been little empirical data regarding which therapy approaches might be more or less effective for which problems. The extant treatment literature indicates that psychoeducational interventions should be tailored to the needs and strengths of the individual child and family (e.g. Albanese *et al*., 1995; Harris & Weiss, 1998; Schopler, 1987), but there is still scant data available to guide these treatment decisions.

Recently, there has been a significant expansion of autism treatment literature (e.g. Koegel & Koegel, 1995; Quill, 2000; Weiss & Harris, 2001). Unfortunately, there remains very little empirical data available on outcome efficacy for improving social skills, and even less on variables affecting outcome. A comprehensive discussion of the recent treatment outcome literature is beyond the scope of this study (cf. AACAP, 1999; Harris & Handleman, 1997; Klin & Volkmar, 2000; Schopler, Mesibov, & Kunce, 1998, part IV). The clinical approach and outcome data from this study are presented with three purposes in mind: First, to describe a therapy approach which appeared to be interesting and engaging to the participants; second, to provide data on which to assess the therapeutic effectiveness of this approach in improving social competence in different types of children with autistic disorders; and third, to stimulate some thought about the nature of social competence, its component skills, and the effective strategies for enhancing it.

The Development of LEGO© Therapy

The use of LEGO© as a therapy medium was arrived at on the basis of what Attwood has called "constructive application," (Attwood, 1998, p. 96): that is, using the child's natural interests to motivate learning and behavior change. Attwood described children with Asperger Syndrome as deficient in the need to please their teachers and parents (and therapists), ignoring the usual social pressures to conform to peer groups, imitate peers, cooperate with them, or compete with them. Consequently, many of the techniques recommended for social skill building which utilized peer instruction and peer modeling, have had little impact, or worse, result in robotic attempts at imitation. Even on a one-to-one basis it is often difficult to sustain motivation to persist with learning tasks that they do not find inherently interesting. Although use of external rewards can improve compliance, these gains are usually short-lived, and intrinsic motivation for learning is rarely achieved (Greenspan & Wieder, 1998; Koegel, Koegel, Frea, & Smith, 1995). At the same time, these children often develop singular, obsessive interests and habits, and appear to have limitless reserves of focused energy and drive when engaged in these activities.

Both Attwood (1998) and Greenspan and Wieder (1998) have recommended utilizing a child's stereotyped interests or behaviors, and finding ways to adapt these to promote the development of social, communication and play skills. Greenspan and Wieder emphasized the need to shape the activity or behavior towards interaction, and verbal communication. Koegel and Koegel (1995) also emphasize capitalizing on a child's choice of stimulus materials to improve motivation, and using natural reinforcers, which result directly from the child's appropriate responses and skill acquisition, rather than introducing an artificial reward system. Most published studies of social skill interventions have also emphasized the importance of peer modeling, peer interaction, and opportunities to practice social competence with peers (cf. Harris & Handleman, 1997; Koegel, 1995).

The idea of using LEGO© as a therapy tool in a structured and comprehensive way arose from an inadvertent observation. Two of my clients, both 8 years old and diagnosed with Asperger's Disorder, were found excitedly playing and talking together in the waiting room. They had coincidentally brought LEGO© creations to the clinic that day, and as one was leaving and the other was arriving, they discovered each other. These two boys had previously shown little or no interest in each other, and low motivation for social interaction in general. After a discussion with their parents, we agreed to try to work with the two of them together using LEGO© as a medium for them to communicate, and to motivate them to continue the relationship.

Initially it was just the two of them. They brought LEGO© constructions to share, or built

LEGO© sets were provided. They were clearly motivated to complete new LEGO© sets (the reader may have seen or experienced this phenomenon directly) and cooperated fully with social skill building strategies—sharing, turn-taking, making eye-contact, following social rules, using greetings and names—as long as they were permitted to build LEGO© sets. A key strategy for sustaining interaction involved dividing the task of set building so that they had joint and interactive jobs to do: one was given the LEGO© pieces to put together, and the other the visual instructions. The "engineer," was required to give verbal descriptions of the pieces needed and directions for assembling them, while the "builder" followed his directions, collected and put the pieces together. There was much checking back and forth between the plan and the creation. Roles were then switched so they both had a chance to be both "engineer," and "builder." Much of this was done through nonverbal communication, and required considerable emphasis on joint attention, eye contact, and "mind-reading" in general (cf., Baron-Cohen, 1995). We also did joint "free-style" building, in which the two of them had to agree upon a project, the design and materials, and the final shape and color of the creation. This required considerable problem solving and some conflict-resolution—rules to follow were provided, but they were generally left to muddle through on their own as much as possible. Eventually, the two of them developed a relationship independent of the therapy, and started meeting for "play dates," outside of the joint therapy sessions.

Individual therapy continued alongside the joint sessions, allowing for reviews, practicing and rehearsing skills and problem-solving strategies so that we could implement these in the next joint session. Individual sessions were also centered around LEGO© building, which we used as an interactive medium for working on turn-taking, perspective-taking, eye-watching, joint-attention, and question-asking. During the joint session, one or the other could be cued about something practiced in individual therapy, such as following gaze, asking social questions, making apologies, or initiating play. The back-and-forth between individual and joint sessions added considerably to the effectiveness of the therapy overall. If something came up in the joint session—an unresolved dispute, an inappropriate or annoying behavior, a frustrating situation that led to a melt-down—we would revisit that in individual therapy and work on the underlying skill.

Group Therapy: "LEGO© Club"

Soon after beginning LEGO©-based sessions with the initial two clients, the LEGO© collection began to grow, and others began to express an interest in using them. The children with autistic spectrum disorders seemed to naturally gravitate towards LEGO©, and ignored the other toys and activities in the playroom (the puppets, paints, sand-tray, dolls, board games, Playdoh, etc. eventually went into the closet). Somewhat surprisingly, the first two LEGO© enthusiasts were happy to have others join them. The LEGO© creations and paraphernalia, LEGO© posters, pictures of the children and their favorite LEGO© creations, postcards from LEGO-Land© trips, and LEGO© magazines and catalogues, soon filled a large playroom. Eventually, there were seven children in the group. Work with the larger group utilized the same strategies that had been developed with the first two members: collaborative work, division of labor, sharing, turn-taking, cued eye-contact and gaze-following, emphasis on verbal and nonverbal communication, and taking advantage of natural opportunities for practicing social support (tearful meltdowns were a common occurrence), social problem-solving and conflict resolution.

Once the decision was made to increase the size of the group, there was a need for increased structure, and a consistent set of rules (cf. Kunce & Mesibov, 1998). LEGO©-based therapy strategies also evolved, such as LEGO© building contests in which members worked in pairs. The group participated in choosing rules for themselves, governing behavior in three areas: (1) LEGO©-rules (e.g., "If you break it, you have to fix it," and "Put the pieces back where you got them,"); (2) rules of conduct (e.g., "No climbing on furniture,"); and (3) social rules (e.g., "If someone else is using it, don't take it," "No teasing," "No yelling," "Don't tell a story if no-one is listening"). These rules were posted in the room and the members, with very little prompting, reminded each other about these when there were infractions.

For the first time for most of them, they identified with a peer group, and began to be motivated by social approval and social status within that group. In order to become a better LEGO© builder, which was associated with increased status with their peers, they needed to learn from them, cooperate with them, solve disputes, and be helpful. Initially we used a formal "LEGO© Points" system, in which points were awarded for behavioral, social and LEGO©-related

achievements which could be traded in for LEGO© prizes (small sets, LEGO© people, etc.). The points became inherently valuable after a while, and were not associated with any primary reward, other than social approval. Group members continued to follow social and behavioral rules, practiced "mind-reading," solved social conflicts, and exhibited pro-social behavior long after the points became merely a verbal "feather in the cap."

The LEGO© Club was instantly popular with parents, in part because their children were highly motivated to participate in the therapy. The parents formed a LEGO©-Club support group in the waiting area. They discussed their children, their IEPs, the impact on their other children and extended families, the strategies they were using at home, etc. Some also began to get together socially outside of the group sessions (Albanese *et al*., 1995; Marcus *et al*., 1997). At the suggestion of a parent, nonautistic siblings were included in the younger groups as role models and "helpers." They were well-suited as helpers, as they were familiar with the problems of their sibling, and required little prompting to provide redirection for stereotyped behaviors, or distraction from oncoming tantrums.

Over time, various social skills strategies were tried. Some were successful, and some were not. New rules and procedures were implemented to avoid previous mistakes: (1) it was much less effective to have children attend the group who did not also have individual LEGO© Therapy sessions, or at least, individual therapy with a colleague who could coordinate individual and group therapy goals when needed; (2) LEGO© Club members often asked to invite guests to the group—this did not wind up being very effective: the guests were generally more interested in the LEGO© collection than their hosts, and had little motivation to follow the group rules; (3) allowing parents to sit in to observe the group was a mistake in almost all cases—the children acted much differently with a parent in the room; (4) having snacks in the LEGO© room was a disaster (LEGO©'s are very hard to clean)—the waiting room became the designated snacking area; (5) including children with behavior disorders, such as ADHD, ODD, or other externalizing disorders, who also had social skill problems, was not productive. Children with anxiety disorders (especially social phobia), depression, or adjustment difficulties manifesting as depression or anxiety, fit very well in the group, and many of them continued to attend as my "helpers," long after their presenting problems were resolved. The format of the group, the medium, the set of rules and the social milieu seemed to work very well with autistic spectrum and anxious or depressed children, but not very well for children with other behavioral disorders.

Effective strategies implemented in LEGO© Therapy included: (1) having siblings attend as helpers—they had to commit to attending regularly; (2) including therapeutic aides, graduate students, or other helpers (but not parents) in the group; (3) allowing group members free play time to be creative and do role-based fantasy play with the figures and sets, rather than just building—this led to greater creativity, verbal communication and spontaneous interaction among group members; (4) encouraging female group members to join—this was especially helpful with the older groups in which adolescent development issues were being discussed; (5) opening the group with a "check-in" time (15 minutes for younger groups, 30 minutes for older groups) in which all members were required to give a verbal account of recent personal experiences, or to share views on a current news topic; (6) having group members make joint decisions about things that affected the group, such as choosing new LEGO© acquisitions, activities for the day, promotions of members or graduations, election of club officers; (7) assigning mentors for newer group members, and encouraging pro-social helping and teaching—this was helpful in improving both the giving and receiving of help in social situations; (8) encouraging families to develop a support and activity network outside of the clinic (Albanese *et al*., 1995; Marcus *et al*., 1997).

Eventually, there were nine LEGO© social skills groups altogether, with members ranging from pre-school to high-school and even college. Some of the original group members were still participating after 7 years. Although the style of interaction in the group changed over time, becoming more verbal, and the types of LEGO© changed (more sophisticated, complex, electronic sets and computer software games), the group membership remained very consistent. The group members became like family members to each other, and other group members' families became like an extended family.

METHOD

Subjects

For the purposes of this study, seven groups of children were chosen, with seven children in each

group. Two subjects did not complete the minimum treatment duration, 12 weeks (both were in military families and left the state), so that $N = 47$, with five groups of seven and two groups of six. There were 34 males and 13 females, all between the ages of 6 and 16 years (mean age = 10–6, $SD = 2.8$). They were all referred to my private practice by parents, pediatricians, other mental health professionals, or by state Department of Health and Department of Education personnel (for many, the services were part of their IEP's or 504 modification plans). All 47 children in the study had been on a waiting list for treatment for at least three months, and 21 of these were on a waiting list for at least 6 months. The design utilized a waiting-list control group, with repeated measures, beginning with an intake assessment, prior to being placed on the waiting list. Consequently, all 47 subjects were able to serve as their own control group for a 3 month treatment trial, and 21 of them were able to serve as a control group for a 6 month treatment period (15 males and 6 females). Many of the children attended LEGO© Therapy and LEGO© Club sessions for much longer than 6 months (a few of the members of the initial group were seen for 7 years), however, these long-term outcome data will be presented in a later study.

Most of the children in the study attended public schools in medium-sized urban center and surrounding suburbs, although some attended private special education schools. All children carried a diagnosis of either Autistic Disorder (AD), Asperger's Disorder (AS), or Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS). Although, generally speaking, children who were referred were eventually placed in a group, occasionally children were not included in a group due to either severe behavior problems, such as aggression, or due to a lack of responsiveness to the medium. A couple of children were placed in groups and then were found to be either dominating the group or becoming excessively passive and withdrawn. In these cases, they were transferred to a different group, in which they were more likely to fit in. These decisions were infrequent, and were made in collaboration with the parents, and any other involved parties (such as IEP teams).

Some of the children in the study were on psychiatric medications. Medications were not changed or discontinued, and no subjects were started on medication during the therapy trial. A careful review of treatment charts was made to ensure that medications and doses that were used during the waiting period were not changed during the treatment phase. The four medications most used were psychostimulants (PS, e.g., methylphenidate), low dose antipsychotics (AP, e.g., respiridone), anxiolytics (AX, e.g., buspirone), and selective seratonin re-uptake inhibitors (SSRI, e.g., paroxetine). Descriptive statistics, including average age, diagnoses, number of subjects in each group, average duration of wait-list, number of male and female subjects, and number of subjects on which medications for each of the seven groups in the 3-month phase (T1), and the 6 month phase (T2) are presented in Table I.

Measures

The goal of the treatment program was to improve social competence. Social competence (SC)

Table 1. Age, Gender, Duration of Wait-Listing, and Medication for Groups 1–7, and Totals for Treatment Phase 1 and Treatment Phase 2

		Age		Gender		Wait List		
Group	N	*X*(y-m)	*SD*(y)	M	F	*X* (y)	*SD*	Medications[a]
1	7	10–0	0.89	5	2	4.86	1.28	PS = 2, SSRI = 1
2	7	7–10	0.41	5	2	5.57	1.75	AP = 1, PS = 2
3	7	7–7	0.52	5	2	5.14	2.67	
4	7	11–8	0.52	5	2	5.50	2.40	AP = 1, AX = 3, PS = 3, SSRI = 1
5	6	15–8	0.55	4	2	4.67	1.46	AX = 1, SSRI = 3
6	6	12–6	0.55	5	1	6.00	1.85	AP = 1, AX = 1, SSRI = 3
7	7	10–5	0.58	5	2	4.86	1.77	AP = 2, PS = 1
TP1	47	10–6	2.85	34	13	5.26	1.93	AP = 5, AX = 5, PS = 8, SSRI = 8
TP2	21	10–10	2.54	14	7	7.03	1.24	AP = 1; AX = 2; PS = 6; SSRI = 5

[a]AP = antipsychotic; AX = anxiolytic; PS = psychostimulant; SSRI = selective seratonin reuptake inhibitor.

was operationalized for the purposes of the study as reflected by three component skills: (1) initiation of social contact with peers, reflective of social interest and motivation for social contact; (2) duration of social interaction, which reflects the development of communication and play skills; and (3) decreases in autistic aloofness and rigidity, with development of age-appropriate social and play behaviors. Although these components reflect somewhat different aspects of social competence, they are inter-related and overall improvement in social ability requires improvement in at least these three skills.

Measures of the first and second dependent variables were based on direct observation of the children during unstructured periods at school when they had free access to familiar peers. The first measure was simply a frequency count for episodes of *self-initiated social contact* (SISC) during a half-hour observation (play-time following lunch). These observations were recorded either by myself, or by a qualified behavioral observer (graduate student assistant or therapist). A "self-initiated social contact," was counted only if it met the following criteria: (1) it was unprompted and spontaneous; (2) it was not part of a daily routine or required activity; (3) it involved either verbal or nonverbal communication or a clear attempt to communicate with a peer; (4) the peer had to be of approximately the same age or developmental level as the subject (i.e., not a much older or younger child); and (5) it was not a reciprocal response to another child's approach. The SISC variable was expressed as: Number of contacts per 1/2 hour.

The second DV was operationally defined as the average *duration of social interactions* with peers (DSI) that were observed during a 1 hour after-school recreation time (recorded in seconds/interaction). The interactions themselves were somewhat different than the SISC in that they were not required to be self-initiated or spontaneous. That is, the duration of interaction was recorded regardless of whether it was the subject or another child who initiated it. The interactions did need to meet these criteria, however: (1) the interaction was clearly a social or play interaction, not part of the daily routine or in response to a teacher's request; (2) there was no adult supervision, interference or prompting throughout the interaction; (3) the subject and a single child or group of children had to interact or be involved in an activity continuously and without breaks of more than 30 seconds; (4) there was clearly an ongoing exchange, verbal or nonverbal, so that it was clearly interactive play rather than parallel play, and the exchange continued throughout (i.e., an initiated interaction would be considered to have stopped if it devolved into parallel play).

There was no overlap of observations between these two DVs, as the first, SISC, was recorded during lunch-time recess, and the second, DSI, was recorded during after-school recreation time. For both SISC and DSI, the data was collected as part of ongoing monitoring of clinical progress for the purposes of reporting status and/or progress to the children's IEP teams. The observations were made prior to the decision to utilize this data for research purposes, and therefore, the observers were less likely to be affected by observer bias. Reliability was calculated *post-hoc* based on regression analyses of observations of the same children ($N = 47$) at different times during the waiting list period (i.e., over a 12 week period during which no change in the DVs was expected). Since contiguous observations by different raters were not available, inter-rater reliability was estimated by using partial regression.

Regression values were calculated for the same observer of the same children at different times (test–retest), and then for different observers of the same children at different times (inter-rater + test–retest), and then with the test–retest error variance partialed out to calculate just inter-rater reliability independent of re-test reliability. For SISC, the re-test reliability was .861, $p < .01$, and for DSI it was .797, $p < .01$. Inter-rater reliabilities were similar: with error variance due to re-testing removed, the inter-rater reliabilities were: rSISC = .866, $p < .01$, and rDSI = .825, $p < .01$.

The third dependent measure was chosen to reflect aloofness and rigid behavior, and was based on a standardized rating of behaviors characteristic of children with autistic spectrum disorders, the Social Interaction subscale of the Gilliam Autism Rating Scale (GARS-SI, Gilliam, 1995). The GARS was completed during standard intake and follow-up evaluations, and was based on parent, therapist and teacher input. The GARS is commonly used as a diagnostic and therapy outcome measure with autistic spectrum children (Collaborative Work Group on Autistic Spectrum Disorders, 1997). The Social Interaction subscale has 14 items, each rated on a four-point Likert scale: 0 = "never observed," 1 = "seldom observed," 2 = "sometimes observed," and 3 = "frequently observed." The items assess

primarily social aloofness, anxiety in social situations, and poor social coping (rigidity). The norms were based on a large sample of autistic children. The raw score total is converted into a standard score, with a range of 1–20, on which 10 represents an average level of disturbance of social interaction for a child with an autistic disorder.

South *et al*. (2002), have questioned the utility of the GARS for clinical and research assessment of autistic disorders. In their study of 119 children with DSM-IV diagnoses of autism, the scale consistently scored below the reference mean score of 100. Although the authors caution against the use of the GARS for diagnosis and assessing symptom severity, the current use of the GARS-SI scale was not for the purposes of diagnosis. A *post-hoc* analysis of GARS-SI scores was conducted in order to determine whether the scale was sensitive to changes in social adaptation (this analysis was conducted as part of another study currently being prepared for publication). The GARS-SI difference scores for two time periods were correlated with Vineland Adaptive Behavior Scale Socialization Domain difference scores for the same time periods (VABS and GARS scores were collected by Department of Education special services evaluators as part of ongoing IEP monitoring). With a sample size of 121, the GARS-SI and VABS-SD had a negative correlation of - .351 ($p < .01$), suggesting a statistically significant correlation between changes in the GARS-SI and an established, more detailed measure of social adaptation.

Design and Data Analysis

The study used a repeated measures design, with subjects serving as their own controls during the initial waiting list period prior to beginning treatment. All subjects ($N = 47$) waited at least 12 weeks, while many ($N = 21$) waited 24 weeks or more. The time at the completion of the 12 week wait is hereafter referred to as C1, while the span of time is referred to as Control Phase 1 (CP1). Similarly, the time of completion of the 24 week wait is C2, and the span of time is referred to as CP2. Time at completion of 12 weeks of treatment is T1, and time at the end of the 24 week treatment is T2. The period of time during the 12 and 24 week treatments are referred to as Treatment Phase 1 (TP1) and Treatment Phase 2 (TP2), respectively. The main analyses used difference scores on the DVs, with values at the start of the phase subtracted from those at the end of the phase. For example, the DV values for CP1 would be the DV scores at C1 minus the DV scores at Intake. Using a waiting-list control group with before and after measures effectively ruled out maturation effects, while the use of difference scores reduced the influence of extraneous intra-group variability, i.e., within-cell error (cf., Johnson & Wichern, 1982). For example, for a given subject, the TP2 SISC difference score at T2 would be his SISC at T2 minus his SISC score at Intake (6 months earlier). This score would be compared with that subject's own CP2 SISC difference score, that is, his SISC score at Intake subtracted from his SISC score at C2.

Independent Variable and Primary Analysis

The main independent variable had two conditions: LEGO© Therapy vs. No treatment, the waiting list control phase. There were two sets of observations: CP1 vs. TP1 and CP2 vs. TP2, requiring two tests of the null hypothesis (Ho: LEGO© Therapy had no effect on SC). The comparisons of the three DVs (GARS-SI, SISC and DSI) were made by use of three *t*-tests for each set of matched samples, using the Bonferroni method to control for the effect of multiple comparisons (Johnson & Wichern, 1982). With regard to the relative change in the three DVs, it was predicted that the change in DSI and GARS-SI would be greater at T2 than at T1, as these factors reflect complex behaviors and skills, while SISC, which reflects a simpler underlying behavior would show more immediate improvement at T1.

Secondary Analyses

Additional comparisons and analyses were made for the purposes of assessing the construct validity of SC, ruling out confound effects, and developing hypotheses for future research. The first analysis involved looking at the relationships among the three DVs to determine if they appeared to be measuring a single construct, using correlation matrices at Intake, T1 and T2. It was predicted that all variables would correlate with each other to a moderate degree, reflecting common variance associated with the underlying SC construct. It was not expected that the relationships among components would change over time.

Language proficiency is a key subject variable that affects outcome in many treatment approaches

(Gray, 1994; Prizant, Schuler, Wetherby & Rydell, 1997; Wetherby and Prutting, 1984). Part of the appeal of LEGO© as a therapy medium is the low demand placed on verbal skill with a heavy emphasis on nonverbal communication and nonverbal play. Consequently, it was expected that language functioning would not be a significant limiting factor for efficacy of LEGO© Therapy. To test this hypothesis, subjects were divided into two groups based on level of language functioning, so that there was a language-impaired group (LI), $N = 23$, and a nonimpaired group (NI) $N = 24$. Language impairment was operationally defined as a global deficit in language resulting in objective test scores of at least two standard deviations below the mean for the child's chronological age. This was based on results of a standardized speech-language assessment completed by a qualified speech-language pathologist within the past 6 months (these evaluations were routinely provided by the state Department of Education for the subjects attending public school, by the staff speech-pathologist at one private school, and by a private practice speech pathologist for the remaining children). The difference scores for the three DVs for NI and LI groups in TP1 were compared using three *t*-tests for matched samples (with Bonferroni correction). There were not enough NI subjects in TP2 to warrant an analysis of the effects of language on outcome at T2. It was predicted that language impairment would not make a significant difference in treatment outcome for any DV.

Differences based on diagnosis of subjects (Autistic Disorder, Asperger's Disorder, and PDD-NOS), are almost completely overlapped with language impairment, so the effect of diagnosis on outcome variables was not assessed separately. All subjects included in the NI group had a diagnosis of either Asperger's ($N = 19$) or PDD-NOS ($N = 5$), while all subjects in LI had diagnoses of Autistic Disorder ($N = 13$) or PDD-NOS ($N = 10$). In order to assess the impact of intellectual functioning on social competence and gains in social competence following LEGO© therapy, subjects' IQ scores (WISC-III) were recorded and correlations with outcome measures are reported below. IQ scores for the NI and LI groups are presented in Table II.

A number of studies have suggested that therapy is more effective if started earlier (e.g., Rogers, 1996), so a negative effect of age of subject on outcome was expected. The analysis of the impact of age on outcome was based on a comparison of difference scores, thereby controlling for levels of social development at the start of treatment. Consequently, any effect of age on treatment outcome would reflect solely the impact of delayed treatment. The impact of age on outcome was assessed using two multiple regression analyses, with age predicting GARS-SI, SISC and DSI difference scores for TP1 and TP2.

Table II. Mean WISC-III IQ scores for Language Impaired ($N = 23$) and Non-Language Impaired ($N = 24$) groups at T1

	Mean	Standard deviation	Range
Language impaired			
Verbal IQ	65.73	10.11	41–85
Performance IQ	81.23	12.76	52–105
Full-scale IQ	70.64	9.27	55–89
Non-language impaired			
Verbal IQ	98.19	15.69	76–129
Performance IQ	99.19	16.00	69–134
Full-scale IQ	97.81	12.58	77–120

Although LEGO© has traditionally been associated with boys' play interests, my experience has been that it appeals equally to both genders (although it is interesting that there do seem to be differences in the style of LEGO© play, and LEGO Corp. has been producing LEGO© products specifically targeting girls for some time now—to be assessed in another study, perhaps). Gender effect on outcome was analyzed using three Student's *t*-test for males and females in TP1 (males = 34; females = 13), one for each of the three DVs. It was predicted that there would not be a significant difference in outcome scores between the male and female groups. There were not enough female subjects in TP2 to warrant analysis of gender effects at T2.

Finally, the duration of the waiting period might have had a negative impact on outcome due to delays in treatment, complications and exacerbations in symptoms in the interim, etc. (maturation effects were ruled out by use of the repeated measures design). The putative effect of length of waiting period prior to treatment was analyzed using two multiple regression analyses (TP1 and TP2) with length of wait as the predictor and GARS-SI, SISC and DSI as the target variables. It was predicted that waiting period would not account for a significant portion of variance in DV difference scores at either T1 or T2.

Procedure

All subjects were given an intake evaluation which included an observation of the child, interview of the parents, and completion of standardized rating forms, including the GARS. Soon afterwards, one or two school visits were arranged to observe the subject in the classroom and on the playground, and meet with teachers or other school staff if possible. If the subject was considered suitable, and the parents and others (including IEP teams) felt that the therapy was necessary and potentially helpful, they were put on a waiting list. The delay for a treatment spot was based less on availability of groups, than on availability of individual therapy time (each group member also received once per week individual therapy).

After a period of 3 months, if a therapy slot was not yet available, the family was contacted and we met to discuss options. School staff were contacted and the subject was assessed to update the treatment plan. If the family and IEP team or other professionals agreed to continue waiting, the subject was again placed on the waiting list. At 6 months, there was another quarterly meeting and usually by then the subject was given an individual therapy appointment and assigned to a LEGO© group. During the treatment phase of the study, the children participated in one individual therapy session (60 minutes), and one LEGO© Club group session (90 minutes), per week. All of the individual and group sessions were held at my office, in the LEGO© Room.

For most of the groups, there were therapeutic aides, and in some instances, graduate students, helping with the group. The sessions were conducted by myself, however, including the initial check-in, and the LEGO© activities for the session. I was present throughout the session, and maintained only as much involvement as was necessary to facilitate appropriate interactions and communication. Initially, when the children were younger and not as experienced with the process, I needed more help from the therapeutic aides, and needed to be more active in prompting and cuing the children, as well as imposing corrective actions, such as reviewing the rules, warning about time-out, and having peers remind them as well. Individual sessions were one-on-one and were generally focused on long-term LEGO© projects which were used a basis for developing communication and reciprocity, as well as for increasing self-efficacy, task-focus, and capacity for independent problem-solving.

Although for the most part, group membership did not vary and the same members attended every group, periodically, group members would move from one group to another, or leave a group, and a new member would be added. When a new member was introduced, the other members were given at least a couple of weeks' warning, and the member was then given an orientation to the group. The members took turns reading the rules to the new member, introducing themselves, and discussing the activities of the group. Our discussion of the rules usually included examples by each of the members of when they had difficulty with a rule, and how this was resolved. Visitors to the group, such as TA's or graduate students, were introduced as visitors, and again, the members were asked to review the rules with them, and discuss the group activities. The person's role in the group was clarified. There was a surprising level of acceptance and flexibility in this regard, even for visitors who clearly had little familiarity with LEGO©.

In order to control for slight variations in attendance and/or scheduling, inclusion of subjects in the two study groups (TP1, TP2) was based on completion of a number of therapy sessions: 12 group and individual therapy sessions to be included in TP1, and 24 group and individual therapy sessions to be in TP2. Luckily, attendance was very good and only two subjects out of 49 did not complete the 12 weeks for TP1. The limiting factor for TP2 was not the number of therapy sessions, but the duration of wait-listing. Only 21 subjects were on the waiting list for at least 6 months.

Once subjects began LEGO© Therapy, there was an initial meeting with the subjects and families to discuss the rules, procedures, and strategies of LEGO© Therapy, and to collect objective data, including GARS ratings. Meetings with school staff and observations of the subjects at school were scheduled as soon as possible after the intake assessment. Re-assessments were done quarterly with all subjects, including both the GARS ratings and direct observations. The LEGO© Club groups ran continuously, and as members "graduated," they were either moved to an older group, or were discharged. New members and their families were familiarized with the group process and the LEGO© Club rules. They viewed photos of the members of their group before meeting them, and usually had at least two individual therapy sessions in the LEGO© room before being introduced to a LEGO© group.

RESULTS

Main Analyses

The mean GARS-SI, SISC and DSI scores for all subjects at Intake, C1, C2, T1 and T2 are presented in Table III. These data were converted into standard scores (mean = 10, SD = 1.0), with the GARS-SI scoring inverted, for the purposes of direct comparison, and are presented in Fig. 1. An ANOVA for matched samples (repeated measures) was used to compare the three DV difference scores from Intake1 to C1 (CP1), with DV difference scores from C1 to T1 (TP1). This ANOVA was repeated for comparisons of the DV difference scores for CP2 (C1 to C2) and TP2 (C2 to T2); see Table IV. Comparability of variances for the two mean comparisons (Levene's Test of Equality of Variances) were calculated for all three DVs at T1 and T2. None of the sample variances were significantly different (all F's < 1); see Table IV. As is evident from Table IV, there was a significant main effect of treatment on outcome data, at T1, with $F(44) = 6.36$, $p < .01$. A *posthoc* examination of cell mean differences indicated that all three DVs were significantly higher in the treatment phase than in the waiting list control phase of the study (all p's $< .01$). At T2, the main effect of treatment was even larger, $F(19) = 13.57$, $p < .01$, and again all three DVs were significantly higher in the treatment phase than in the waiting-list control phase (p's $< .01$).

The results overall indicate significant differences between the treatment and control phases on all three DVs for both CP1/TP1 and CP2/TP2. The subjects' DV scores showed significant improvement at T1 and T2, while their scores remained essentially unchanged during the waiting list period. As is clear from an examination of the CP1 and CP2 data (Table III and Fig. 1), no improvement was made in SC measures over a 6 month period, indicating that without the social skills intervention, it is likely that the subjects would have made little if any improvement over an indefinite period of time (i.e., no evidence of maturation).

Treatment had a clinically significant impact on all three SC measures. On DSI, TP1 participants improved from an average of 21.00–36.55 seconds in 12 weeks (74% increase), and TP2 participants increased their DSI to 55.71 seconds in 24 weeks. That is, a 175% increase in duration of social interaction with peers in an unsupervised and unstructured situation. This was in marked contrast to the

Table III. Mean GARS-SI, SISC and DSI for All Subjects at Intake, C1, C2, T1 and T2

Treatment/control phase	Dependent variables					
	GARS/SI[a]		SISC[b]		DSI[c]	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Intake	10.15	1.47	2.53	1.90	19.83	12.89
C1 ($N = 47$)	10.25	1.39	2.40	1.99	21.00	12.04
C2 ($N = 21$)	10.00	1.69	2.40	1.99	19.71	9.17
T1 ($N = 47$)	8.87	1.56	4.06	1.72	36.55	13.18
T2 ($N = 21$)	7.19	1.29	4.38	1.28	55.71	20.60

[a] Lower score on GARS-SI indicates improvement.
[b] SISC = number of contacts per ½ hour.
[c] DSI = average duration of interaction.

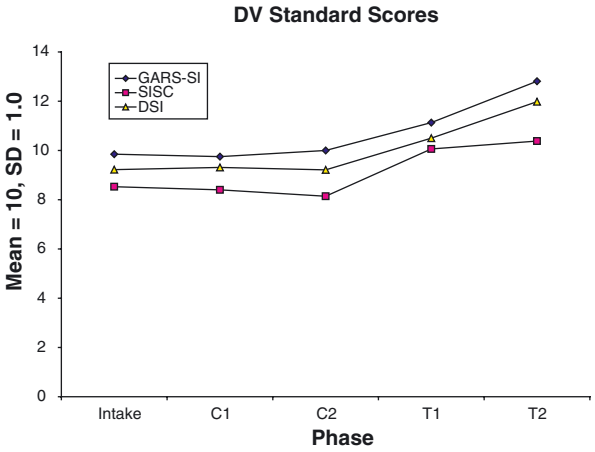

Fig. 1. Standard scores (mean = 10, $SD = 1.0$) for GARS-SI, SISC and DSI, at Intake, C1, C2, T1 and T2.

Table IV. Results of ANOVA's for Matched Samples Comparing GARS-SI, SISC and DSI Difference Scores for Treatment and Control Phases at 12 Weeks (T1/C1—Intake) and 24 Weeks (T2/C2 – T1/C1).

			Levene's test for equality of variances	
T1: CP1 vs. TP1 ($N = 47$)				
Overall	$F = 9.15$	$p < .01$		
GARS-SI	$F = 4.53$	$p < .01$	$F = .737$	$p \geq .39$
SISC	$F = 4.33$	$p < .01$	$F = .921$	$p \geq .34$
DSI	$F = 5.97$	$p < .01$	$F = .753$	$p \geq .39$
T2: CP2 vs. TP2 ($N = 21$)				
Overall	$F = 13.57$	$p < .01$		
GARS-SI	$F = 6.06$	$p < .01$	$F = .794$	$p \geq .38$
SISC	$F = 4.51$	$p < .01$	$F = .093$	$p \geq .96$
DSI	$F = 7.32$	$p < .01$	$F = .342$	$p \geq .56$

waiting list control phase during which there was virtually no change in the average DSI: 19.83 seconds at Intake, 21.00 seconds at C1, and 19.71 seconds at C2 (no significant differences, *t*-test values < 1.0). There were also large gains in SISC during TP1 and TP2. As was predicted, SISC improved most in the first 12 weeks (2.40–4.06 contacts per ½ hour, 69% improvement), and then the gains were slower for the next 12 weeks (4.06–4.38 contacts per ½ hour, 8% improvement). These gains were significantly better than during CP1 and CP2, when SISC showed a slight decrease (2.53–2.14 contacts per ½ hour) see Fig. 1. There were also large decreases in the GARS-SI scores from C1 to T1 and from C2 to T2. Again, as was predicted, the improvement from C1 to T1 on this measure (−1.38) was less evident, than from C2 to T2 (−2.81), suggesting that improvements in complex social behavior patterns take longer than gains in motivation to initiate interaction.

Secondary Analyses

Correlation matrices for inter-correlations of the three DVs at Intake, T1 and T2 are presented in Table V. At Intake, all three of the DVs show moderately strong and statistically significant correlations, with the strongest relationship between SISC and GARS-SI. At T1, the correlations are weaker, although still significant for the relationships between SISC and GARS-SI, and GARS-SI and DSI ($p < .01$). At T2, only the relationship between GARS-SI and SISC is still significant ($p < .01$). Overall, then, the correlation data support the use of these three variables to represent a single construct, social competence. It is not clear why this relationship becomes less evident as the subjects improved. The GARS-SI measure appears to be the single best predictor of treatment outcome, and correlates best with both of the other components. This is not surprising since the scale contains items related to both social aloofness and inappropriate behavior in social contexts.

Table V. Correlation Matrices of Dependent Variables at Intake, T1 and T2

	GARS-SI	SISC	DSI
Intake			
GARS-SI	1.00		
SISC	−.596[a]	1.00	
DSI	−.382[a]	.365[a]	1.00
T1			
GARS-SI	1.00		
SISC	−.459[a]	1.00	
DSI	−.374[a]	−.026	1.00
T2			
GARS-SI	1.00		
SISC	−.530[a]	1.00	
DSI	−.197	−.060	1.00

[a] $p < .01$.

The impact of language impairment on the outcome data was not as predicted (see Table VI). The language impaired (LI) group, $N = 23$, scored significantly lower on the SISC variable for TP1. Although this difference was not large, it was statistically significant. Since difference scores were used, the difference between the groups on outcome was not due to the LI group starting at a lower point on SISC. This finding suggests that despite the use of a therapy medium that accommodates language deficits very well, subjects with a communication deficit continue to lag behind subjects without language deficits in initiation of social contact with peers. Of course, the good news is that the LI group was not different from the NI group on either of the other DVs, GARS-SI and DSI. This result suggests that the LEGO© Therapy was effective in improving duration of peer social interaction and decreasing autistic withdrawal and rigidity in language impaired subjects just as effectively as subjects without language deficits.

A canonical correlation analysis was performed with IQ scores at T1 (Verbal, Performance and Full-Scale) as predictors, and changes in SISC, DSI and GARS-SI from T1 to T2 as target variables, in order to assess the impact of IQ on treatment outcome. There were no significant correlation between IQ scores and change in outcome measures, with an overall canonical correlation of .202 (N.S.). WISC-III scores did not predict changes in SISC (canoni-

Table VI. GARS-SI, SISC and DSI Difference Scores for Language-Impaired (LI) and Non-Language-Impaired (NI) Groups at T1.

	Mean difference scores				
	LI ($N = 23$)		NI ($N = 24$)		
Dependent variable	$\bar{X}$	SD	$\bar{X}$	SD	*t*-test ($df = 46$)
GARS-SI	1.22	0.95	1.54	1.25	0.99, N.S.
SISC	1.22	1.68	2.25	1.82	2.02, $p < .05$
DSI	1.39	0.85	1.63	2.24	0.49, N.S.

cal $r = .133$, N.S.) DSI (canonical $r = .152$, N.S.), or GARS-SI (canonical $r = .050$, N.S.) indicating that LEGO© Therapy efficacy was not affected by cognitive level of participants.

The multiple regression analyses with age as predictor and the three DVs (expressed as difference scores) as criteria for TP1 and TP2 showed no significant correlation between age and outcome. For TP1, the multiple $r = .163$, N.S., and for TP2, multiple $r = -.032$, N.S. These results were somewhat surprising given the weight given to early intervention in the literature. Of course, in the current study, none of the subjects was at an age that would be considered to be early childhood (the youngest subject was six at the start of the waiting list phase). The age range of children in the study was limited to mid-childhood to teens, and so this may not have been a fair test of the hypothesis that treatments starting earlier have greater impact.

The Student's *t*-tests on differences between means for male and female subjects on the difference scores for the three DVs are presented in Table VII. As was expected, there were no differences between male and female subjects on any of the outcome measures, suggesting that gender differences do not affect the efficacy of LEGO© Therapy. Finally, there was no statistically significant relationship found between duration of wait list and outcome at either T1 (multiple r (47) = −0.16, N.S.) or T2 (multiple r (21) = 0.18, N.S.).

DISCUSSION

Overall, the research results support the use of LEGO© as a therapeutic medium for improving social competence in children with autistic spectrum disorders. Statistically significant and clinically meaningful gains in three measures of social competence were made after 12 weeks of therapy, and these gains were sustained and even larger after 24 weeks. The therapy approach would not be considered intensive, in that it required only two and a half hours per week, 1 hour of individual and 90 minutes of group therapy. Nonetheless, the participants showed improvements in initiation of social contact with peers, duration of social interaction with peers, and decreased scores on a standardized measure of social impairment (GARS-SI). From a clinician's point of view, it is especially important that the gains made as a result of the intervention were apparent in unstructured and unsupervised social situations at school, and not just on rating scales or in the therapy room, or while under the direction of an in-school therapist or aide.

Table VII. GARS-SI, SISC and DSI Difference Scores for Male and Female Subjects Groups at T1

	Mean difference scores				
	Male ($N = 34$)		Female ($N = 13$)		
Dependent variable	$\overline{X}$	*SD*	$\overline{X}$	*SD*	*t*-Test ($df = 19$)
GARS-SI	1.35	1.09	1.46	1.27	0.28, N.S.
SISC	1.88	1.79	1.38	1.71	0.89, N.S.
DSI	1.33	0.90	1.22	1.39	0.27, N.S.

The results reported have methodological and psychometric limitations, however, which should be taken into consideration. First, the ratings were not made by blind observers. Although the data was collected prior to the decision to use them for research, there is nonetheless some potential observer bias, and inter-rater and test–retest reliability values were only moderate. The use of the GARS-SI subscale is also somewhat questionable since the GARS has shown some psychometric problems (South *et al.*, 2002), and the SI subscale has not been established empirically as a measure of clinical change (data on this issue is currently being prepared for publication, and initial analyses show a reasonably good correlation between changes in the GARS-SI and changes in the Vineland Socialization Domain).

The treatment strategies that were implemented in the therapy were similar to those described by other clinicians, including behavioral intervention, peer support, use of rules to guide social behavior, and guided practice of social problem-solving. The unique aspects of LEGO© Therapy are: (1) blending of individual and group therapies to enhance efficacy of both; (2) use of play materials, LEGO©, which were inherently interesting and motivating to the clients, and which lent themselves to promoting social interaction and development of social competence through collaborative and interactive play; (3) creation of a social group with which the clients' identify and which helps develop a need for social approval in order to enhance peer modeling.

The results reported above are somewhat preliminary, and further research is clearly needed in order to elucidate important aspects of the interven-

tion. First, it will be important to try to determine the extent of generalization of LEGO© play and improvements in social competence to multiple contexts, as well as over a longer time period. Second, further research should analyze the components of the intervention to determine which are the most important and effective features, such as the individual vs. group modalities, behavior reinforcement, social rule-setting, collaborative work, nonverbal format, improvement of play skills, etc. In this regard, it would also be helpful to determine what impact the therapy is having on underlying social cognition and attitudes, such as theory of mind (Baron-Cohen, 1995), social interest, social anxiety, self-efficacy and/or need for social approval. Of course, it will also be important to understand why it was that LEGO© was such an effective modality of intervention for these children, that is, what is it about LEGO© that made it so attractive to the subjects, and why did it sustain the interest of so many autistic children for so long?

The answer to these questions in part is the nature of the materials themselves, and the way they were developed. The LEGO© Educational Division (formerly LEGO© Dacta©) has long supported use of LEGO© materials in classrooms, and recently there have been some broad-based and comprehensive studies assessing the efficacy of LEGO© as opposed to more traditional teaching materials (e.g., Falbel, 1999; Noble, 2001). The study by Falbel (sponsored by both LEGO© Dacta© and MIT's Media Lab, under direction of Dr. Seymour Papert) is especially instructive. The study assessed the impact of the provision of LEGO© educational materials to a large number of elementary schools in Peru. The researchers examined educational and psychological variables in a sample of male and female 2nd, 4th and 6th grade students at 15 schools provided with LEGO© activities daily ($N = 1653$), as well as a matched sample of control schools in which LEGO© materials were not available. Measures included assessments of academic skills in four areas (Mathematical skills, Technological knowledge, Spanish performance, Eye-hand coordination), and an assessment of "pedagogical self-esteem." The MIT researchers found significant gains in all of the academic areas as well as on the Self-Esteem Inventory (SEI, Coopersmith, 1981).

Teachers involved in the study reported that the LEGO© participants had shown improvements in confidence and sociability: "It is noticed that, those students who before would not talk, now express more freely and keep closer relationships with their classmates. In some way or another the work around the LEGO© Dacta© material implies communication within the working group. That would encourage the development of inter-learning groups and the consideration of the work in group as one of the best ways to make an efficient mediation." (Falbel, 1999, p. 20). Although there have not been studies of LEGO© used as a mental health intervention *per se*, the wide use of LEGO© in educational settings, from elementary to high schools, suggests there is certainly an undeveloped potential for clinical applications.

It may turn out in the long-run that there is nothing unique about LEGO©, after all. The importance of the present study may be that a method for engaging autistic children in a therapeutic process was found. Other strategies for improving the social interest and motivation for learning social skills in autistic children may be readily available. At present, however, these methods are not apparent in the research literature. In fact, the methods most widely researched are for the most part, as noted earlier, un-engaging and difficult to get motivated participation. LEGO© Therapy seems to allow autistic children to have their cake and eat it, too: They showed considerable measurable benefit, and they enjoyed themselves.

The finding of improvements on all three measures of social competence in subjects who exhibited significant language impairment, in addition to social skills and coping deficits, is an especially important result. Although these subjects did not do as well as their nonlanguage impaired peers on self-initiating social contact, they made significant gains nonetheless, especially on sustaining social interactions with peers, and in terms of reducing autistic aloofness and rigidity (as measured by the GARS-SI scale). Given that social skills play such an important role in long-term outcome, LEGO© Therapy may be an important intervention strategy for this population, especially those for whom the opportunity for early intensive behavioral intervention has been missed. The results here suggest that language impairment does not need to be a limiting factor in terms of improving social competence in middle-childhood clients. The methodology of intervention likely makes a big difference, though: the language impairment factor may not have been so small in an outcome study of a language-based therapy approach. Cognitive level of subjects also did

not affect outcome, with an overall weak correlation between IQ scores and outcome measures.

The finding of no relationship between age of subject and outcome was especially encouraging. This was not expected, although, as was noted above, there was no early-childhood comparison group—perhaps children starting younger would have done even better. An attempt at a younger LEGO© Therapy group has been attempted, however, with mixed results. The impetus for social play and the development of a need for social approval, as well as the awareness of social and behavioral rules, were much less evident in the younger subjects. Fine motor and hand-eye coordination were also limiting factors, although this may be ameliorated by use of the early-childhood LEGO© materials (LEGO© Duplo©). An attempt at early-childhood LEGO© Therapy may still be warranted. The absence of an age effect was also surprising given that many of the older subjects appear to lose interest in LEGO© sometime after puberty. Luckily, this did not seem to be a factor, due in part, no doubt, to the sophistication of the LEGO© materials developed for teens (LEGO© Technic©, LEGO© Media©, LEGO© Mindstorms©). Many of my young-adult clients—and not-so-young-adult colleagues—still enjoy long, productive visits to the LEGO© room.

The moderate level of correlation among the three dependent measures supports the construct validity of Social Competence as it was used in this study, and each of the measures appeared to be measuring both unique and shared variance in the target construct. Nonetheless, the use of the three DVs was cumbersome, both in terms of collecting data, and analyzing results. Unfortunately, there is not currently a single measure of social skills or social competence which combines structured observation with standardized assessment of component skills (verbal and nonverbal communication, understanding social rules and norms, motivation, competence, social cognition). This is certainly an area that warrants further research.

In conclusion, the LEGO© play materials appear to be a particularly effective medium for working with autistic spectrum children. The materials lend themselves well to a variety of intervention strategies, and the inherent interest for playing with them strongly improves the willingness of clients to engage in therapeutic activities, and to engage both with the therapist, and peers, in joint tasks. Although this research was not supported by the LEGO Corporation in any way, there has recently been an increase in educational grants and research focused on the benefits of the LEGO© system. Other clinicians and educators may wish to explore the utility of LEGO© with other clinical populations, and in other treatment modalities. A more detailed manual describing the methods of intervention presented in this study will be, hopefully, forthcoming.

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