Play and Social Skills in Children on the Autistic Spectrum.
(Using a Lego®-based Approach)

By June Grindley, 2014

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Abstract

Individuals on the Autistic Spectrum are known to have difficulties developing socio-communication skills. Play is widely accepted as vital in the development of these skills. An effective intervention for enhancing these skills in those on the spectrum is the Lego Play Approach. Progressing through play levels, individuals are supported from parallel to cooperative play by role taking in teams, model building, free play and group time. Previous research indicated improvement in socio-communication skills and compared the intervention to the Social Use of Language Programme. However, none examined patterns of socio-communication development as individuals progressed through play levels, and any reflection in individual abilities and motivation. The research examined in this article aims to investigate these patterns thereby providing more detailed information about the Lego Play Approach implementation. Using a data mining method, information from a real life intervention was examined to identify sequential patterns of socio-communication skills. Furthermore, this information was analysed to determine if development was noted at home or in school settings. Results indicated socio-communication skills development in those on the spectrum followed the general pattern of development in neurotypical children resonating with previous child developmental research, when conflict resolution was supported. This pattern was reflected in abilities and motivation as children progressed through Lego Play Levels. Motivation was a key factor, however an interest in Lego may not always have created the motivation necessary for boys to make progress. In addition generalisation occurred to the home or school settings. Conclusions were that children on the autistic spectrum can gain socio-communication skills following general developmental patterns when supported in conflict resolution. A Lego interest is beneficial though not a requirement. Recommendations included placing those of similar abilities together; giving opportunity for consolidation of skills; and implementing more than 9 Sessions.

Introduction

Autism Spectrum Disorder (ASD) is a spectrum defining pervasive developmental disorder including Asperger's Syndrome (AS), High Functioning Autism (HFA), Classic Autism and Pervasive Developmental Disorders Not Otherwise Specified (PDD-NOS) (Humphrey & Parkinson, 2006; Lord, 2007) affecting more than 1 in 100 people (National Autistic Society, 2013). Individuals with ASD in the UK currently receive a diagnosis when impaired in imagination, social development and communication (ICD-10, 1993). This article primarily examines the area of social development in individuals with an Autistic Spectrum Disorder (ASD) (ICD-10, 1993). Play has a crucial role in the understanding and development of socio-communication skills (Broadhead, 2006a), and less joint play provides less opportunity for the development of important socio-communication skills (Jordan, 2003). Individuals on the autistic spectrum naturally engage in less sociable joint play (Hobson, Lee & Hobson, 2009). Therefore, interventions which help development in social play for children with ASD are not only helpful, but necessary.

One such intervention is the Lego Play Approach (LPA). It uses the Lego interests of those with ASD, supporting them to develop social strategies which can be used to gain targets (LeGoff, 2004; LeGoff & Sherman, 2006; Owens, Granader, Humphrey & Baron-Cohen, 2008). Participants move through play levels from parallel to cooperative and collaborative play, though the approach does not use these terms. There is a Group Time where participants gather and share news; a Lego Building Time where participants work in teams to produce models; and a Play Time where participants are free to play. More detailed information is given by LeGoff (2004).

Although, many details are given within previous studies on planning and implementing an LPA, and flexibility in use of the intervention is mentioned, questions remained. These related to the sequential patterns of socio-communication development as individuals moved through the Lego play levels with regards to their abilities, motivation and progress, and how this affected the implementation of the intervention: Is there a relationship between the skills achieved and the Levels of play; Which skills are achieved at which levels and can specific areas of developmental needs be targeted? Should participants of similar abilities work together; Is an interest in Lego required for the intervention to be effective?

Given the necessity for more detailed information on the development of socio-communication skills in those with ASD to aid individualisation and implementation of interventions, the research aimed to provide additional information on the LPA and its implementation. It was outlined in terms of development in 3 sets of socio-communication skills (A, B and C) as individuals progressed through Lego play levels. A data mining approach was adopted in order to analyse the data in a new way, to determine any sequential patterns as individuals moved through the play levels with regards to their abilities, motivation and progress. As early communication skills are a critical part of the process (Greenspan & Wieder, 1997) these were included in the measures.

The main questions were:

1. What are the sequential patterns of development and do they reflect individual abilities, motivation, and stages of progression?

2. Does the progress generalise to home or school settings?

These were examined in terms of 4 sub questions:

1. What are the steps individuals take as they go through the Lego play levels in terms of socio-communication skills and what are the underlying developmental skills?
2. Are there patterns to them?
3. Has motivation been affected by an interest in Lego?
4. Has generalisation been observed in the home or school settings?

Though not the main focus of the study, attendance was examined to determine if it influenced results.

1: The Current Research

In terms of the data, the researcher was previously involved in a real life LPA intervention, affording an opportunity for her to use the data from that previous project to examine the new questions noted above.

In terms of definitions, play constitutes a wide variety of characteristics and providing a definition is inherently difficult (Fisher, Hirsh-Pasek, Golinkoff, Gryfe, 2008)). For the purpose of this study given that social play is being examined, in terms of characteristics the following have been adopted:

- voluntary
- including playfulness
- intrinsically motivated
- activity based
- spontaneous
- flexible
- explorative
- including choice
- including interactions with play partners

In terms of the process, play is being viewed as a continuum from solitary, through parallel and cooperative play to collaborative play (Frost, Wortham & Reifel, 2008; Wolfberg, 2003: Broadhead, 2006a; 2006b). White's, 2006, 'Advanced Group Play' is seen as requiring more advanced leadership socio-communication skills (ibid).

Given previous positive outcomes of the research into the LPA (LeGoff, 2004; LeGoff, & Sherman, 2006; Owens, Branader, Humphrey & Baron-Cohen, 2008), and in the light of the research suggesting sequential and inter-related development in socio-communication skills through play (Wolfberg, 2003; Broadhead, 2006a; 2006b), it is expected that results will show sequential patterns of development, reflecting individual abilities and stages of progress, (Greenspan & Wieder, 1997; Hobson et al, 2012) though what these will be for those with ASD is difficult to ascertain. As research has indicated the importance of motivation in learning through play, it is expected that an interest in Lego will have improved the outcomes of those who participated in the previous intervention project (Koegel, Werner, Vismara & Koegel, 2005; Blanc, Adrien, Roux & Barthelemy, 2005; Dykstra, et al, 2012).

2: Methodology

2.1: Design

The current study used a sequential data mining method enabling quantitative and qualitative analysis. Individual data derived from the previous LPA intervention was analysed for levels of ability, motivation and attendance. It was sequentially examined in order to provide longitudinal data on patterns of socio-communication skills. Furthermore, the relationship between 3 skills sets, A, B and C, was investigated.

Skills set A included the abilities of:

Lego Worker Level (LWL)

- working with Lego with another person.

Lego Teamer Level (LTL)

- waiting and listening to team members.
- taking on the roles of Builder, Supplier and Engineer.

Lego Designer Level (LDL)

- clearly explaining individual ideas to the team.
- creating an individual freestyle Lego model.

Lego Master Level (LML)

- jointly creating a freestyle model with another team member.
- listening to the team and agreeing on a final model.

Lego Genius Level (LGL)

- creating a sequence or story with the team.
- directing the sequence or story.
- listening to the teams' ideas, explaining individual ideas and negotiating a final idea.

(Intervention Lego Levels Chart (Appendix A)).

Skills set B included:

- Joint Play (JP)
- Interpersonal Engagement (IE)
- Cooperation (Cpn)
- Conflict Resolution (CR)

(Tick Sheet: Appendix B)

A comparison was made between a wider set of socio-communication skills as observed by Broadhead, 2004; 2006a, 2006b and 2009, and Seach, 2007 (Broadhead, 2004; 2006a; 2006b; 2009; Seach 2007), Skills Set A, and the narrower Skills Set B, which allowed for the production of analysis sheets. These sheets were examined in terms of a category regarding individuals and a category regarding the group.

A 3rd skills set, C, was analysed to determine improvements observed by staff during the initial intervention. Data sheets were produced allowing for a comparison in the group category with Skills Sets A and B.

Skills Set C included:

- taking a turn.
- staying calm when faced with a problem.
- thinking up solutions to problems.
- discussing solutions to problems.
- deciding on the best solution and accepting it, even if it was not their own.
- asking for help instead of getting upset.
- being able to work in a team of 2, 3 or 4.
- listening better.
- explaining ideas.
- being focussed on the task.
- trying things out.
- following instructions.
- concentrating for longer.
- playing with others.
- being part of a big group.

(Staff Evaluation Form: Appendix C)

The researcher was involved in determining data collection methods of the initial intervention project, which was philosophically grounded as a longitudinal, triangulate project. In order to avoid subjectivity she was not involved in the majority of the data collection which was undertaken by staff of the charity whom she had trained.

2.2: Ethics

Ethical approval for the research was received from the University of Strathclyde in Glasgow and was adhered to at all times.

2.3: Participants

As there was no new data for this study, there were no participants. However, it was appropriate to ask permission for the data to be used, and consent was therefore sought and received from parents and staff of the intervention.

2.4: Materials and Measurement

2.4.1: The Previous Intervention Project

As materials for the research originated from 9 sources of data from a previous intervention project, it was beneficial to set this information within the context of that LPA.

Based on guidelines in the research by LeGoff, 2004, the previous intervention had a Group Time (semi-structured), a Lego Building Time (structured and scaffolded), a Snack Time and a Free Play Time (both free time unless adult intervention was required) (ibid). Children moved through Lego play levels from Lego Worker Level (LWL), to Lego Teamer Level (LTL), to Lego Designer Level (LDL), to Lego Master Level (LML) to Lego Genius Level (LGL) on the basis of their performance in Lego Building Time. This was done in line with ABA principles in order to provide motivation to proceed to the next level. Instructions from Lego kits were used for LWL and LTL. (See Appendix D for a more detailed procedure). A Problem Solving strategy was taught in order to deal with conflicts.

Consent was sought from participants to use data gathered from that previous LPA in the current study. Of those who took part, consent was received to use the data from 18 boys between the ages of 5 and 12 yrs and 12 staff. Data sources were:

- Tick Sheets including staff comments (Appendix B).
- Lego Levels Charts (Appendix A).
- Individual Target Sheets and achievement observations from staff (Appendix E).
- The researcher's observational diary.
- Video footage.
- The Social Play Record Home Comments Sheet (White, 2006).
- The researcher's reports.
- Staff Evaluation Forms (Appendix C).
- Parent/Carer Feedback Forms (Appendix F).

2.4.2: Materials for the Current Study

From these data sources, analysis sheets were developed in order to provide contextual data and to enable the extraction of information from the previous LPA for the research. These sheets allowed for the investigation of:

- Skills Sets A (Lego play levels achieved and being worked on by individuals in each session) (Appendix A))
- Skills Set B (Joint Play (JP), Interpersonal Engagement (IE), Cooperation (Cpn) and Conflict Resolution (CR))
- Skills Set C (Staff Feedback (Appendix C))
- any further individual skills.

These were examined in terms of 2 categories: Individual; Group.

Within Skills Set B, JP included a measure of where individuals were on the play continuum in relation to the amount of play involvement. A measure of individual's engagement with peers in terms of joint focus and response and support required was given in IE. (NB: staff feedback at the end of the previous LPA indicated that ratings were decided on levels of support given, not on verbal and non-verbal abilities as per Appendix B). A measure of cooperation (in the general sense), clarity of communication and new idea generation was included in Cpn, and CR included Emotional Self-regulation (ES) and Problem Solving (PS) in a conflict situation. Problem Solving abilities included measurements for turn-taking, listening, negotiation and compromise.

The analysis sheets also allowed for the examination of motivational influences, as the Social Play Records Home Comments Sheet (White, 2006), was clear in describing the interests of the children involved.

Grid 1 gives a list of all analysis sheets for the research. Additionally it indicates the area of focus in terms of contextual information and the questions of this study (attendance, motivation, abilities, and generalisation) and the source of the data from the previous LPA.

Grid 1 : Summary of Materials

Analysis Sheets	Skills Set/Contextual Information	Category	Focus	Source
Number of Sessions Attended	Contextual Information	Individual	Attendance	Tick Sheet (Dates)
Lego Interest	Contextual Information	Individual	Motivation	Social Play Record Home Comments Sheet (White, 2006); Observational Diary
Socio-communication Skills Development	A and B	Individual and Group	Abilities	Lego Levels Charts; Observational Diary; Individual Target Sheets; Researcher's Reports
Lego Play Levels Achieved	A	Individual	Abilities	Lego Levels Charts
Lego Levels Gained by Number of Sessions Attended	A	Individual	Abilities Attendance	Lego Levels Charts; Tick Sheets
Lego Interest by Lego Play Levels Achieved	A	Individual	Abilities Motivation	Lego Levels Charts; Social Play Record Home Comments Sheet (White, 2006); Observational Diary
Lego Interest by Lego Play Levels Achieved by Number of Sessions Attended	A and B	Individual	Abilities Attendance Motivation	Lego Levels Charts; Tick Sheets; Social Play Record Home Comments Sheet (White, 2006)
Colour-coded Ratings for Joint Play, Interpersonal Engagement, Cooperation and Conflict Resolution by Individual	B	Individual	Abilities	Tick Sheets; Lego Levels Charts
Colour-coded Ratings Totals	B	Individual	Abilities	Tick Sheets: Lego Levels Charts
Frequency Distributions for Joint Play, Interpersonal Engagement, Cooperation and Conflict Resolution	A and B	Group	Abilities	Lego Levels Charts
Skills Improvement by Staff Evaluation	C	Group	Abilities	Staff Evaluation Forms
Additional Comments	A, B and C	Individual and Group	Abilities Motivation Attendance	Tick Sheets (Comments); Individual Targets Sheets (Comments); Observational Diary; Researcher's Reports; Social Play Record Home Comments Sheet

Analysis Sheets	Skills Set/Contextual Information	Category	Focus	Source
				(White, 2006); Staff Evaluation Forms Parental/Carer (Comments); Feedback Forms (Comments)

3: Analysis Procedure and Results for the Research

3.1: Analysis Procedure

Data was gathered and explored in order to determine individual and group totals over time with regards to Skills Sets A (Lego play levels), B (JP, IE, Cpn, CR) and C (skills from feedback). Each boy was designated a number in order to identify individual development.

As results produced from the analysis sheets were extensive, it is beneficial to explain the detail of the analysis procedure in association with each set of results. Therefore the specific analysis procedure for analysis sheets is outlined throughout the results.

3.2: Results

Results are described sequentially under 4 main sections:

- Interests, Skills and Attendance
- Skill Ratings (i.e. degree of skill)
- Skill Frequencies
- Evaluations.

3.2.1: Interests, Skills and Attendance

Number of Sessions Attended

It was decided that fragmentary attendance would produce data which could not be analysed in order to answer the research questions. A natural separation point occurred at 5 sessions or more. Therefore the number of sessions attended were totalled for children who attended 5 or more sessions. Four boys did not meet this criteria, therefore their data was not included.

Lego Interest

As Lego is a construction toy and those with ASD are interested in construction toys, in order to determine the effects of a specific interest in Lego on socio-communication skills development as opposed to an interest in construction toys in general, each boy's interests were placed in 1 of 3 groups: 'Lego Interest', 'General Construction Toys Interest' and 'Other Interests'. Each play level achieved and the ones being worked on, by each boy, at the end of the 9 sessions were noted. Totals were taken of sessions attended. Areas of interest were correlated to play levels achieved (Skills Sets A and B) and the number of sessions attended per boy. Results showed 6 boys were interested in Lego, 7 had other interests, 0 had a 'General Construction Toys' interest and there was no record for 1. Table 1 (Appendix G) indicates 5 of the 6 boys with a Lego Interest achieved LDL, 3 of whom attended 6 sessions, 1, 8 and 1, 9. In comparison 3 of the boys with Other Interests achieved LDL, 2 of whom attended 5 sessions. Boy 4 had an interest in Lego, attended 5 sessions and achieved LWL.

Additional Comments

In order to provide additional contextual information, direct quotes (except for information in brackets) providing relevant information in line with each set of results, were extracted from the data sources. Where possible, session numbers were added.

With regards to an interest in Lego, Boy 1, noted as having 'Other Interests' in Table 1 (Appendix G) was "keen to engage" in Session 4 (Table 2, Appendix H) and Boy 14, also noted as having 'Other Interests', "seems to really enjoy the sessions". Boy 2, another with 'Other Interests', was "not keen to participate" in Session 5. Boy 3 "plays with his Lego alone" and "does not like anyone messing up his Lego". In addition Boy 4 "plays with Lego all the time" and is "very good at building the models", and Boy 5 with an interest in Lego was "very eager to participate but was frustrated by the lack of interest his group members showed." Furthermore, Boy 7 was noted as saying he "didn't like Lego".

Socio-communication Skills Development

Data was extracted from the data sources to produce a list of socio-communication skills in line with previous research and worked on at each Lego play level (Skills Set A). These incorporated the narrower Skills Set B. This data was used to determine if Skills Set B and the wider skills had been achieved before boys were moved up to the next level in Set A. The amount of adult support required was also extracted in order to provide further information on skills development. (NB children only worked at LWL for their 1st session and many were able to work in teams).

Table 3 (Appendix I) indicates underlying skills were targeted at LWL (e.g. toleration of others). At LTL work on a wide range of skills across the whole play continuum was being carried out (e.g. waiting and listening to others, and CR). At LDL, there was more focus on advanced skills (e.g. shared goal understanding and persuasion). At LML the abilities of CR, negotiation and compromise were targeted and things that had been seen as problems, causing conflict, were no longer seen as such. Also, recognition and offers of help emerged and were supported. No one reached Lego Genius Level, however Skills Set A shows that leadership skills would be required. At each level consolidation of developing skills was required and more advanced skills began to emerge. The amount of support necessary decreased throughout the levels, except with CR. There was a progression in skills development and abilities, in association with Skills Set A and support was required at every play level for CR/ES and CR/PS.

Interests, Skills and Attendance

Notable points from the above results are:

- With regards to Motivation, Attendance and Skills Set A, Boy 4 had a particular interest in Lego and achieved LWL. Some boys who attended 5, 6 and 9 sessions achieved LDL.
- With regards to Skills Sets A and B, underlying skills were supported and achieved at lower play levels and more advanced skills were supported and achieved at higher play levels, except for CR for which support continued to be required.

3.2.2: Skill Ratings

In order to examine patterns from Skills Set B (JP, IE, Cpn and CR) in more detail by individual and for the group, and relationships between these and Skills Set A, colour-coded grids were created. Each degree of skill, as measured in the previous LPA, was colour-coded. Categories for absence, relating to attendance, opting out, indicating motivation and attendance, working 1-1 with an adult, working completely alone, both reflecting abilities, and no data recorded, were also coded. Each child's degree of skill was then colour-rated and placed progressively by session. The ratings from Session 1 were used as a baseline as no data was available on children's ability levels. Colour codes ranged from white as lowest, to dark as highest, except for CR, for which red was lowest in ES and dark green was highest. In addition, for PS letters of U (unable to enter into problem solving process) was lowest, TL (could turn-take and listen) was middle rated, and TL, NC (could turn-take, listen, negotiate and compromise) was highest. A coding of NP was used when no problems arose. (See Appendix J for Keys)

(Boys 1 to 6 were all in 1 group. All except Boy 5 chose to opt out of Session 7 and all chose to opt out of Session 8. Boy 4 worked 1 to 1 with an adult in Session 4)

Play levels were added to each session. Patterns were examined and codes created for improvement observed after the 1st session (I); variability with no improvement after the 1st session (V); stayed the same as the 1st session (S); and a definite decline after the 1st session (D).

Table 4 (Appendix K) Boy 3 started at the 2nd top rating for every skill except CR/PS and improved in every skill. Boy 4 improved in Cpn and CR, and was variable in JP and IE. Boy 5 started at the top or 2nd top rating in every skill. Boy 7 declined in IE in Session 9. Boy 9 got top ratings for Cpn in Sessions 6, 8 and 9. He started at the top or 2nd top rating in every skill except Cpn which improved. He was variable or declined in every other skill. Having been at a lower rating in Session 3 he was at the 2nd top rating for Session 4 in JP, IE and Cpn.

In order to investigate where skills could be improved, data from these colour-coded ratings by individual was examined and those who began at the top (△), or 2nd top rating (□ or ✿), were identified. (As there were only 3 ratings for Problem Solving, the 2nd top has not been indicated.) Totals of 'I', 'V', 'S' and 'D' were summed from the same data to enable further analysis from a group perspective.

Table 4 (Appendix K) indicates for JP, 5 boys had a code of variable, 3 of whom started at the 2nd top rating, and all the other boys improved. For IE, of the 9 who did not start at the top rating 8 improved. For Cpn, the boy who declined started at the top rating, all others improved. For CR/ES, of the 5 boys who declined, 3 started at the top rating. Of the 3 boys who were variable, 2 started at the top rating and the 1 who stayed the same started at the 2nd top rating. Of the 4 boys who improved, all improved in Cpn. For CR/PS of the 3 boys who declined, 2 started at the top rating. Of the 5 who declined in CR/ES, 4 improved in JP, IE and Cpn and the 1 who declined in CR/PS and needed to improve in all 3 skills, did so. Of the 4 boys who improved in both CR/ES and CR/PS, all improved in IE and Cpn.The greatest number of improvement ratings for the group were in Cpn. The greatest number of decline ratings were in CR/ES, followed jointly by CR/PS and IE, then Cpn with none for JP.

Relevant direct quotes were taken for individuals relating to JP, IE, Cpn and CR (ES/PS).

Table 5 (Appendix L) for JP indicates Boy 1 was able to work in a team, but worked 1 to 1 with an adult due to a different level of functioning ability. Boy 2 had an inability to compromise in Session 2 and by Session 9 he was able to play with peers for all of the time. Boy 4 agreed to work in a team, but did not for Session 3 as they "could not decide on a kit together" and for Session 5 he "preferred to work alone". Also, Boy 7 did not participate in the LPA for very long during Session 9 as he "did not want to do Lego tonight". The comments for Boy 10 show school was unsettling his behaviour (Session 4), and he chose not to play with his peers, though he could (Session 9).

Table 6 (Appendix L) indicates for IE Boy 7 did not want to take part in the LPA during Session 9 and shows Boy 9 took time out from his team in Session 3, and Boy 11 was unable to demonstrate IE due to his peer's lack of concentration. Boy 12 (coded at the top rating for his 1st session) was jointly focussing and responding with no support for a short period of time. In Session 6, comments indicate that he could lose interest quite quickly, but worked well when talking. Boy 13 had a lack of interest during Session 5.

Table 7 (Appendix L) shows for Cpn Boy 4 did not enjoy cooperating with others in Session 9. Boy 5 was "cooperating with a peer through trying to do what has been asked" in free play time, "could work on listening

to others' ideas a little more" in Session 2 and was "LDL" in Session 5. Boy 11 was generating ideas on his own in Session 8 and was able to express ideas in Session 9. Boy 14 was moved to LDL in Session 6 by mistake. In his 2nd week at LDL his Cpn rating improved and in his 4th Session at LDL his IE rating improved.

Table 8 (Appendix L) for CR/ES and CR/PS shows Boy 3 only liked doing tasks he wanted to in Session 1 and had a great session in Session 9. Boy 4 found it difficult to compromise. Boy 5 got frustrated over the lack of interest his peers showed in Session 1. Boy 6 was involved in a conflict over deciding on a kit in Session 1, that he needed help in Session 2, that he lost interest a bit in Session 4, and that he wanted to be in charge in Session 9. Boy 7 was "very patient with other members" in Session 7 at LML. Boy 9 struggled to take on roles, and Boy 11 got upset and down when things got harder.

Notable points for JP, IE, Cpn and CR (Skills Set B for individuals) are:

- many of the boys improved in their skills, though their ability was not always reflected in their skill rating during a session. Reasons for this provided in the additional comments, were wide ranging and included circumstances at school, the interplay of socio-communication skills, peer abilities, lack of interest and the process becoming harder.
- where boy's skills were variable or declined, they all began at the top or 2nd top rating, except for Boys 1 and 4 in JP, Boy 4 in IE and throughout the skill of CR. In particular for Cpn every boy improved their rating except 1 who began at the top rating. CR was the area where results indicated 'Stayed the Same', 'Variable' and 'Declined' most. For CR/ES, the majority who declined improved in JP, IE and Cpn. The greatest number of improvement ratings for the group were in Cpn. The greatest number of decline ratings were in CR/ES, followed jointly by CR/PS and IE, then Cpn with none for JP.

3.2.3: Skill Frequencies

In order to further analyse data in terms of degrees of skill for the Group Category, data from Colour-coded analysis sheets was used to indicate the frequency of each skill rating from Skills Set B (JP, IE, Cpn, CR), per Lego play level, per session. Each rating for each boy for each session was charted and correlated to the play levels of each boy. Percentages were taken of the totals for comparison purposes and to correct for individuals achieving different play levels.

Joint Play Frequency Distribution

Table 9 (Appendix M) shows the lowest rating of 'None' had a proportion of 0% at LWL, 55% at LTL, 27% at LDL and 18% at LML. The highest rating of 'All of the time' had a proportion of 0% at LWL, 30% at LTL, 40% at LDL and 30% at LML. The degree of JP improved proportionately as progress was made through the play levels.

Interpersonal Engagement Frequency Distribution

Table 10 (Appendix M) indicates the lowest rating of 'Not jointly focussing and responding' had a proportion of 0% at LWL, 50% at LTL, 50% at LDL and 0% at LML. The highest rating of 'No support' had a proportion of 22% at LWL, 22% at LTL, 26% at LDL and 30% at LML. The degree of IE improved as progress was made through the play levels.

Cooperation Frequency Distribution

Table 11 (Appendix M) shows the lowest rating of 'None' had a proportion of 22% at LWL, 33% LTL, 22% at LDL and 22% at LML. The highest rating of 'Doing what has been asked, asking for clarification and building an idea together' had a proportion of 6% at LWL, 6% at LTL, 38% at LDL and 50% at LML. The degree of Cpn improved proportionately as progress was made through the play levels.

Conflict Resolution Frequency Distribution

Indicated in Table 12 (Appendix M) the lowest rating of CR/ES and CR/PS 'Upset and Unable to enter into problem solving process, had a proportion of 21% at LWL, 53% LTL, 16% at LDL and 11% at LML. The proportion of 'Calmed down with support and Able to turn-take and listen to suggestions' was 39% at LTL, 26% at LDL and 11% at LML. The proportion of 'Calmed down with support, Able to turn-take and listen to

suggestions and Able to negotiate and compromise' was 5% at LTL, 8% at LDL and 3% at LML. The proportion of 'No problem' was 0% at LWL, 14% at LTL, 36% at LDL and 50% at LML. There were proportionately fewer instances of individuals being upset and requiring to be distracted as they progressed through play levels, and proportionately more instances of 'No problem' at LML. Where individuals calmed down on their own, negotiation and compromise were greater.

Notable points for Skills Set B for the group are:

- the degrees of JP, IE and Cpn improved proportionately as progress was made through the play levels.
- with regards to CR/ES and CR/PS, the lowest rating for the boys was proportionately most frequent at LTL and a coding of 'No problem' was proportionately most frequent at LML, with the highest rating of 'Negotiation and compromise' at the 'Calmed down on own' rating for ES.
- The highest proportionate improvement in rating was for both Cpn and CR with 50% for each at LML.

3.2.4: Staff and Parent/Carer Evaluation

In order to analyse data for Skills Set C (staff and parent/carer feedback forms (Appendices C and F)), improvements observed by staff and parents/carers were totalled. Percentages were taken to correct for a difference in number of forms returned and comparison purposes.

Table 13 (Appendix N), additional comments, shows Boy 1 could listen better "has developed his ability to accept other's ideas" and "benefitted from working in a group". Boy 3's cooperation "only extended to those of similar ability to himself". Boy 11 was "able to transfer skills". Boy 14 "gained more confidence enabling him to communicate more".

Table 14 (Appendix N) indicates that Boy 14 was initiating requests when he would not have done so previously.

Table 15 (Appendix N) indicates for Boy 3 there was a "big difference" and Boy 9 "could do many of these things before, but… there is an improvement."

Comparison of Staff Evaluation Skills Improvement to Parent/Carer Evaluation

Table 16 (Appendix O) shows Staff Evaluations indicate 'Asking for help instead of getting upset' (with reference to emotional self-regulation) and 'Being able to work in a team of 2, 3 or 4' (with reference to cooperation) had improved most, with a proportion of 43% each. Parent/Carer Evaluations indicate 'Taking a turn' (an underlying skill) and 'Playing with others' (with reference to cooperation) had improved most with a proportion of 73% each. In 11 out of 15 skills Parent/Carer Evaluation shows a greater improvement in the home or school settings with 'Taking a turn' and 'Explaining ideas' observed proportionately more at 44% and 43% respectively. 'Being focussed on a task' and 'Trying things out' were observed by the same amount proportionately, and 'Asking for help instead of getting upset' (with reference to CR/ES) followed by 'Discussing solutions to problem' (with reference to CR/PS negotiation) were observed more by Staff in the play scheme setting with a proportionate difference of -7% and -3% respectively.

Notable points for Skills Set C, improvement with regards to generalisation are:

- all skills generalised into the home or school settings.

- Parent/Carer Evaluations show 'Playing with others' had one of the greatest proportionate generalisations at 73%, and Staff Evaluations indicate 'Being able to work in a team of 2, 3, or 4 was one of the highest improvement skills with 43%. (Both related to cooperation).

- The comparison shows 11 out of 15 skills were identified as having a proportionately greater improvement in the home or school settings.

In summary, Skills Sets A and B results show sequential patterns of socio-communication development as progress was made through Lego play levels. Skills Set B results indicate this was not always demonstrated in individual abilities, which were variable.

At Lego Teamer Level it was necessary to work on a large number of skills: underlying skills were being supported along with the early degrees of more advanced skills.

Five out of 6 boys with an interest in Lego achieved Lego Designer Level. When boys were particularly skilled with Lego there were problems. Boys with other interests improved their skills.

With regards to improvement in skills, Cpn showed the greatest improvement in terms of number of boys. It was also jointly greatest in the degree of skill improvement, as measured in ratings (along with CR/PS) over the play levels, with the lowest number of top ratings at the start. CR/PS had the 2nd lowest number of top ratings at the start.

Regarding attendance, boys who attended 5, 6 and 9 sessions made similar progress.

In terms of Skills Set C, generalisation occurred into the home or school setting with a greater proportion of skill improvement in the latter settings. A skill associated with increased ability to play and work with peers improved the most in all settings. A skill associated with CR improved the least.

4: Discussion

These results help to provide answers to the questions outlined in this study as individuals progressed through the LPA. The main questions were:

1. What are the sequential patterns of development and do they reflect individual abilities, motivation, and stages of progression?

2. Does the progress generalise to home or school settings?

These were examined in terms of 4 sub questions:

1. What are the steps individuals take as they go through the Lego play levels in terms of socio-communication skills and what are the underlying developmental skills?
2. Are there patterns to them?
3. Has motivation been affected by an interest in Lego?
4. Has generalisation been observed in the home or school settings?

In order to determine if attendance influenced results, this was also examined.

Results indicate sequential patterns of development, generally in line with neuro-typical development as progress was made through levels of play corresponding to a continuum model. This resonates with research by Broadhead, 2004; 2006a and 2006b (ibid). However, support was required throughout the previous LPA for Conflict Resolution corresponding to previous research by Koning and Macgill-evans, 2001, (ibid). Though abilities were present, these were not always demonstrated which may have been due to different factors as described in additional comments. Motivation to participate was key, which may have been provided by an interest in Lego in some cases, however, an affiliative motive may also have been required. Generalisation was observed in the home or school settings with some evidence that development generalised in a similar way.

Socio-communication skills developed for the group in a progression from underlying skills to more advanced skills as evidenced in Table 3 (Appendix I). This is shown in the association between the target skills in Set A and the socio-communication skills worked on and achieved at each play level. Play commenced at either a solitary or parallel point at Lego Worker Level (LWL), the 1st play level. Results indicate that each boy was able to work with Lego with another person in their first session (Table 3 Skills Set A), This was further evidenced by the 0 ratings of 'None' and 'Not jointly focussing and responding' for Joint Play (JP) and Interpersonal

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Engagement (IE) in Skills Set B (Frequency Tables 9 and 10, Appendix M), which may indicate that everyone was able to tolerate others to a degree and jointly focus. In addition frequencies indicated the more advanced skills of Cooperation (Cpn) and Conflict Resolution (CR) required further development as the lowest degrees of these skills <u>were</u> recorded at LWL. In their 2nd sessions boys advanced to the 2nd play level Lego Teamer Level (LTL) where play moved towards Cpn through team work on further underlying skills including toleration of <u>peers</u>, listening, waiting, turn-taking, and extending joint focus and response. The necessity to aid development in a wide range of socio-communication skills was apparent (Table 3. Appendix I) as support in the more advanced skills of CR/PS negotiation and compromise was evident. This may have indicated an interplay of skills within the boys' developmental processes, and resonates with Broadhead's, 2004; 2006a; 2006b; 2009, research in line with neuro-typical development (ibid). It also presented the challenge of supporting both low and high level skills in the early stages of the process in order to maintain joint play, so that skills could be developed further, corresponding to research by both Wolfberg's, 2003 (ibid) and Howe, Petrakos, Rinaldi and LeFebvre's, 2005, (ibid). Furthermore, children at lower levels (Skills Set A) had conflicts more frequently and adult intervention was often required.

This progression was reflected in individual abilities and motivations as evidenced in the case of Boy 4's results. Regarding skills Set B and additional comments, in terms of ability, when his CR skills (including higher level skills of a developed emotional self-regulation, negotiation and compromise) were challenged in Session 3 over a decision on a kit (Table 8. Appendix L), distraction was the strategy which enabled him to calm down (Table 8). In Session 4 when he worked 1-1 with an adult his Cpn and CR skills improved. This may have been due to less peer involvement, so less of a social challenge. However, his inability to compromise continued as Session 9 additional comments indicate ("finds it difficult to compromise": Table 8) and he remained at LTL (Table 1. Appendix G). In addition JP and IE, both low level skills, stayed variable (Table 4. Appendix K). This case may indicate that challenges on undeveloped, underlying socio-communication skills caused conflict, prevented play maintenance, and prevented further development.

Unexpectedly, with regards to motivation, Table 2 (Appendix H) shows Boy 4 not only had an interest in Lego, but was particularly skilled in using it. Therefore, an interest in Lego alone may not have provided the motivation necessary to have a shared goal and play jointly. A motivation to relate to peers and make friends may also have been required to facilitate joint play and lead to joint intention (in line with research by Smiley's, 2001, (ibid) and Calder, Hill and Pellicano's, 2012, research (ibid)). This would lead to cooperation and collaboration with peers. Boy 4 could not regulate his emotions in a conflict situation (Table 8. Appendix L). If the basis of learning ES is through the exploration of responses to another person (Seach, 2007) and an emotional connection (Hobson, Lee & Hobson, 2009), he may not have dealt with conflicts because he did not have the motivation to do so, evidenced by the fact he "attempted to work as part of a team but preferred to work alone" (Table 8). Langner and Winter, 2001, noted that an affiliative motive promoting friendship was required for CR through compromise and negotiation (Langner & Winter, 2001). Improvement in socio-communication skills was present when he worked 1-1 with an adult who supported play maintenance (Tables 7 and 8. Appendix L), yet he remained unable to maintain play with peers. However in this study there was no measurement for an affiliative motive, so it is not possible to determine the exact nature of its influence.

Additional comments in other cases show that various factors may have influenced play maintenance. These included external issues (e.g. school problems), and internal issues of motivation (e.g. a lack of interest in taking part) cited in Table 5 (Appendix L). As in Boy 4's case, many of these issues may have caused difficulties with CR/ES (Table 8). One which related to the implementation of the LPA and different levels of socio-communication ability was indicated in Boy 1's case. In Session 2, he could not be put in a team because other boys found it "too frustrating as he (was) not at a similar level of functioning" (Table 5. Appendix L). This may have been when social skills were challenged due to peer abilities, conflicts arose, play was not maintained, and adult intervention was required. It was therefore necessary to have boys of similar abilities in the same team at LTL.

At Lego Teamer Level (LTL), therefore, there was evidence that both underlying and more advanced skills were progressing which indicated an interplay of socio-communication development in those with ASD as they moved into cooperative play. It was necessary to have members of similar abilities in teams which allowed for greater periods of play and further progress in underlying and low level abilities and enhanced degrees of ability of higher level skills. An interest in Lego alone may not have provided enough motivation for Boy 4 (Table 2.

Appendix H.) to progress further than this play level in the previous LPA. He may also have required an affiliative motivation

At Lego Designer Level (LDL) underlying skills from Sets A and B were no longer the focus. Progress had been made to work on the more advanced skills of shared goal understanding and cooperation, and collaborative play was in evidence through 'occasionally suggesting ways of developing the idea' and persuasion (including the abilities to generate and clearly explain ideas) (Table 3. Appendix I). This may have been due to an increase in perspective taking through work on imagination in line with previous research by Battistich et al, 1989 (ibid). Foreseeing a model design required the use of imagination, and clarity of explaining the idea was required not only for shared goal understanding, but also persuasion of team members in accomplishing that goal. Frequencies indicate play maintenance had increased as evidenced in JP (Table 9. Appendix M), as had joint focus and response as shown in IE (Table 10. Appendix M). Therefore, underlying skills development, consolidated at LTL, coupled with continuing support, particularly in CR skills, may have enabled the establishment of an environment necessary to foster the more advanced skills at LDL. Results from Table 11 (Appendix M) evidenced this as progress in degrees of Cpn (which required increased communication through listening, expressing ideas and building ideas together) increased through the play levels, resonating with Smiley's, 2001, research (ibid). Additionally in terms of individual abilities, from Skills Set B those who started at the top or 2nd top rating required little development in a skill in relation to measures. Table 4 (Appendix K) indicates the greatest improvement was made in Cpn. Though CR support continued to be required, proportionate frequencies of lower level ratings of CR/ES decreased and 'No problem' proportionately increased (Table 12. Appendix M). This may indicate strategies were developed through CR/PS, so that circumstances which had previously caused problems, no longer did, play was maintained and Cpn increased. Furthermore, results show where JP and IE needed to improve (in relation to measures), they did, except in 2 cases in JP and 1 case in IE. Therefore, individual underlying skills worked on at LTL may have been achieved, allowing for consolidation and work on more advanced skills at LDL.

Regarding progress, individual abilities and motivation at LDL, an unexpected result occurred in the case of Boy 14 who was moved to LDL by mistake in Session 6 (Table 7. Appendix L). In his 2nd week at LDL his Cpn rating improved and in his 4th session at LDL his IE rating improved. His general communication skills had improved by Session 3 when he was at LTL as evidenced in Table 15 (Appendix N). Therefore, his Cpn may have improved due to support in doing what he had been asked, asking for clarification, and developing and explaining ideas, before his joint focus and response skills were demonstrated. Thus more advanced skills requiring regulation (as defined by Blanc, Adrien, Roux and Barthelemy, 2005) and imagination may have been demonstrated first, due to the provision of support for lower skills in the semi-structured setting, resonating with the research of Blanc, Adrien, Roux & Barthelemy, 2005 (ibid).

Comments in Table 2 (Appendix H) indicate Boy 14 really enjoyed the sessions, "especially being creative with the bricks at play time". Therefore, the previous LPA may have afforded opportunity for him to be imaginative in the free play setting and create new ideas, which may have enabled him to respond emotionally, facilitated an attitude of playfulness, resonating with Youell's, 2008, research (ibid), and motivated him. This may have enhanced his communication skills, so that when supported in his area of difficulty, he was able to utilise and demonstrate more advanced socio-communication skills and play in a more cooperative way, correlating to Hobson et al's, 2012 research (ibid).

At Lego Designer Level (LDL), therefore, more advanced cooperative skills were being targeted and supported including shared goal understanding and persuasion. Furthermore, there was evidence of collaboration through the development of ideas. This progression is reflected in individual abilities, and motivation.

At Lego Master Level (LML), though not completed by anyone, the work carried out indicated a move towards both advanced teamwork and friendship skills, corresponding to White, 2006 and Broadhead's 2004, 2006a, 2006b previous findings on neuro-typical development (White, 2006; Broadhead, 2004; 2006a; 2006b). Table 3 (Skills Set A. Appendix I) shows "flexibility in unwritten rules", and "Recognising when others need help and offering it" emerged and were being supported. These were unexpected results at this level, because children with ASD have difficulty being flexible, as Blanc, Adrien, Roux and Barthelemy's, 2005, findings showed (ibid), Empathising with others and reacting with appropriate responses is also an area of difficulty for them, as Sigman, Kasari, Kwon and Yirmiya's, 1992, study showed (ibid). Development may have been due to

scaffolding and support given in previous play levels, enabling the development and consolidation of underlying and lower level socio-communication skills on which these higher level skills developed, resonating with Greenspan and Wieder's, 1997 and 2005, research (ibid).

Regarding the abilities of seeing when others needed help and offering it, the support of turn-taking, listening and waiting in the CR/PS process along with scaffolding for IE with joint focus and response (all Skills Set B), may have enabled the development of joint attention (as indicated in research by Seach, 2007), which may have led to shared goal understanding, clearly explaining ideas and Cpn (Skills Set B) as evidenced in Smiley's, 2001, research (ibid). These may have influenced the advancement of CR/ES and PS development (Skills Set B) corresponding to Broadhead's, 2009, research (ibid). Imagination and perspective taking may also have developed enabling empathy and the ability to recognise and respond to the need for help in others, corresponding to Broadheads, 2004; 2006a and 2006b, research (ibid). As previously noted, at LDL there was opportunity for the development of imagination through creativity, which was measured in Cpn through "suggesting ways of developing the idea". The process used for scaffolding CR/PS also included this development through the creation of strategies for negotiation (Both Skills Set B).

With regards to flexibility in unwritten rules, the ability to self-regulate and move between new ideas quickly would be necessary as evidenced by Blanc, Adrien, Roux and Barthelemy's, 2005, research (ibid). It may have been that work done on role-playing and role-transition, enabled flexibility, as evidenced in Murdock and Hobbs, 2011 research (ibid). As previously noted, support was given for idea generation necessary for flexibility at LDL. In addition turn-taking of roles was supported (evidenced in Table 8. Appendix L), particularly at LTL, which provided a structured environment for PS to be employed and may have enabled flexibility to increase through negotiation where turn-taking was employed. As previously indicated, challenges may have created conflicts more at LTL, and the necessity for ES. Resonating with Koning & Magill-evans, 2001, research, (ibid) this highlighted the difficulty the boys had with ES, making it necessary for support. However, with that support in place, the development of further skills may have been enabled. An example of this is detailed in the comments for Boy 9 (Table 8). As indicated in Table 8 the LPA highlighted an inability for him to role take and role transition, which may have caused conflict. Support through the problem solving process, may have enabled him to take on roles, transition between them and become calmer. Thus the LPA may have challenged him, caused conflict, supported him by giving him coping strategies, and enabled his socio-communication development in the more advanced skill of flexibility, corresponding to Broadhead's, 2009, research. (ibid). It may have been that as skills developed he became better at play maintenance and more socially adept. Table 4 (Appendix K) indicates he began at the top or 2nd top level for 4 out of 5 of the measured skills (Set B), showed variability or decline in those skills, but improved in Cpn which was the skill he needed to develop. As previously noted, Cpn included a measure for flexibility (creating ideas).

On examining this example further, with regards to reflection of abilities, there was a discrepancy between Boy 9's abilities and the demonstration of those abilities in different sessions (Table 4. Appendix K). Furthermore, Table 4 shows most of the boys who were variable or declined in a skill ability, began at the top or 2nd top rating in that skill. As each separate skill required little improvement in relation to measures, integration of skills may have been a difficulty, caused by planning difficulties, resonating with Blanc, Adrien Roux and Barthelemy's, research (ibid). Boy 5 began at the top or 2nd top rating in all skills (Table 4). Additional comments in Table 7 (Appendix L) show that, during the free play time, he was "cooperating with a peer through trying to do what has been asked" (which was also a level 2 rating measurement on the tick sheet) for Cpn. Therefore, in the less structured setting his Cpn rating was lower, indicating he had difficulty with planning and integration of skills. That said, he also had difficulty with CR/ES and PS (negotiation and compromise) (Table 4). Table 8 (Appendix L) indicates that a frustration due to his team members' lack of interest challenged him and Table 7 shows that he needed to listen "to others' ideas a little more instead of going along with his own". All these require flexibility as does integration of skills, thus it may have been that development in this more advanced skill, to a greater degree, was required to improve the integration of all his skills. In addition, though CR/ES and PS continued to be a challenge, support with CR, by increasing flexibility, may have enabled development. Further sessions may have facilitated more development in this skill. In addition, the interplay between socio-communication skills development is highlighted.

On examining evidence for the association between flexibility and CR further, Table 3 (Appendix I) shows at LML "things that would have been problems and caused internal conflict were no longer seen as problems in

some cases", and Table 12 (Appendix M) shows that fewer problems were recorded. This provides further evidence that problem solving strategies may have improved flexibility and CR/ES. It is, however, difficult to ascertain the exact role played by CR in this research as boys responded in different ways and data was not detailed enough to do so. Table 4 (Appendix K) shows those who began at the top rating and declined for ES, improved in JP, IE and Cpn, corresponding to research which has shown that conflict aids the development of cooperation and collaboration between individuals and enhances cognitive development (Kruger, 1993; Broadhead, 2009). Yet, though CR/ES is cited as an area of difficulty for those with ASD (Koning & Macgill-evans, 2001), it is the skill with the greatest top or 2nd top ratings at the beginning of the previous LPA (7 boys: Table 4). Table 12 indicates there were problems on the first night, so it may have been that motivation was so high that ES was facilitated. This was evidenced by comments from Table 2 (Appendix H) indicating 5 of those boys were either interested in Lego or enjoyed participating, resonating with Dunst, Trivette & Masiello's, 2011, research. As a common interest in Lego enables engagement with others (LeGoff, 2004), this may have provided the motivation for joint play, which (as shown by Hobson, Lee and Hobson's, 2009, research), could have provided the motivation for taking the other person's view into consideration due to identifying with others. This may have led to ES, motivated by a desire (in line with Vygotsky, 1933, research) for shared goal achievement (Bratman, 1993). Regarding motivation, an interest in Lego may have been beneficial as, of the 6 boys who moved on to LML, 5 had a Lego interest. However, as 3 of the 7 with other interests also reach this play level, a specific interest in Lego for the previous LPA may not have been necessary (Table 1. Appendix G). This was supported further by results from Tables 2 and 4 which indicate for Boy 7 "when asked if he tried harder to get to next level he said he didn't as he didn't like Lego". He improved in JP, Cpn and CR/PS. Therefore, though he was not motivated by an interest in Lego he was willing to participate and improved. His Cpn and CR/ES were already at the 2nd top rating at the start, indicating a high degree in those skills, and Cpn improved to the top rating whilst CR/ES remained the same throughout, therefore motivation may not have been as necessary in his first few sessions (He attended 6: Table 1). Table 8 shows he was "very patient with other members" of his team which indicates good employment of CR/ES. As he had, and used, these more advanced skills when participating, this may have been enough to improve other skills, resonating with Howe, Petrakos, Rinaldi and LeFevbre's research, 2005 (ibid). Notably for this boy, he declined in IE in Session 9 as he "only participated in Lego for a short period.. didn't want to do Lego tonight". Therefore, though he had a higher degree of ability, it was not demonstrated, which may indicate there was a threshold where motivation became more important (Table 6. Appendix L). Therefore, a motivation to participate may have been required, which emphasised the importance of motivation in the longterm. This provides further evidence that an interest in Lego was beneficial for the development and demonstration of socio-communication skills.

Therefore, at Lego Master Level (LML), more advanced socio-communication skills were being supported involving more collaboration, and higher degrees of Conflict Resolution skills were being addressed. Fewer problems were apparent, which may have been due to the problem solving approach facilitating socio-communication development. Furthermore, there was evidence that a motivation to participate may have been necessary.

Table 3 (Appendix I) (Lego Play Levels Achieved) shows that no one began Lego Genius Level (LGL), however, given that it involved directing a project, 'Advanced Group Skills' necessary for leadership (White 2006), may have been the main focus (i.e. more flexibility, persuasion, compromise and negotiation in the context of leadership (Smiley, 2001; Broadhead, 2009)). In order to move to this level, boys may have been required to have achieved collaborative play, the focus at LML, the previous play level. (That is where the emphasis is on team members to rely on each other in order to reach their goal through their skills (Dooly, 2008), adult support is much lower, (if necessary at all) and relationships are more important (Broadhead, 2009)). As the boys continued to require support for CR at LML, it indicated their skills may not have advanced enough for them to have progressed to LGL. These more advanced skills employ a fully developed ES, a difficulty that many had when challenged, as previously indicated. They also require the ability of perspective taking (in order to imagine the views, thoughts and ideas of another person), an understanding that the self can influence others, the ability to create new ideas, clearly explain those ideas and the ability to integrate all these abilities along with the motivation to do so (Hobson, 2009). As evidenced in previous research (Greenspan & Wieder, 2005) it is possible for those with ASD to gain these skills. Boy 3 may have been at the point of doing so. He started the sessions at the 2nd top rating in Skills Set B for everything except CR/PS, which improved and in Session 9 he "had a great session, played with his peers for all of the time" as evidenced in Tables 4 (Appendix K) and 5 (Appendix L). In addition there is further evidence from progression in behaviour shown in

additional comments (Table 8. Appendix L) that support given through the problem solving strategy, may have enhanced his development so that the problem he initially had of sharing Lego, was no longer a problem within the structured setting of the Lego Time (Table 13. Appendix N). As previously indicated, this included work on turn-taking, listening, negotiation and compromise. Furthermore he was able to "play quite well with friends and family" (Table 2. Appendix H) before the sessions, which may have indicated the affiliative motivation which others may have lacked. Therefore, attaining this level of development may have required more advanced initial degrees of skill, coupled with a motivation to make friends, resonating with Hobson's, 2012 research (ibid). However, for the previous LPA further sessions would have been necessary for participants to move to LGL level to determine this.

In summary, regarding Skills Sets A and B and the first question, evidence indicated an association between Lego play levels progression and patterns of socio-communication skills development in line with neuro-typical development when Conflict Resolution was supported, particularly in the area of Emotional-Self Regulation. Progress was made from parallel play through cooperative to more collaborative play, with less support required at each level except for CR. At each level, though not the main focus, skills from the previous level were consolidated. This may show from a group perspective, skills from Set A were not only developing in line with neurotypical sequential patterns of socio-communication progression, but also being achieved in this way. This was reflected in individual abilities as those who progressed to higher play levels (Skills Set A) had higher degrees of skill in terms of the previous LPA baseline measures (Skills Set B). The fact that Conflict Resolution skills, particularly in terms of ES, required to be supported throughout, may have been an indication of undeveloped skills in terms of both underlying skills for those at lower play levels, and advanced skills for those at higher play levels. In addition affiliative difficulties may have influenced progress. The interplay of skills development was evidenced as support was given for some of the more advanced skills at lower play levels, though these were not targeted at that level. This presented the challenge of supporting several levels of skill at LTL and there is evidence that the problem solving approach enhanced development of both underlying and advanced skills. The ability to integrate skills may also have been important as abilities demonstrated in early sessions were not always demonstrated in subsequent sessions, which may have been due to external and internal challenges.

Furthermore in terms of Skills Set B, for the group, the progression of each separate skill was by degrees from lower ratings to higher ratings in association with play levels (Skills Set A). Therefore separate skills developed in association with progression through the LPA.

In relation to Skills Set C and generalisation, improvement was observed in the charity setting and generalisation occurred into the home or school settings, with a greater proportionate improvement noted in the home or school settings (Table 16. Appendix O). Generalisation was expected, and resonates with previous research (LeGoff, 2004; LeGoff & Sherman, 2006). This may indicate a development in flexibility, as flexibility is required to use skills in different settings as previously shown Luckett, Bundy & Roberts, 2007 (ibid). Though results are not detailed enough to ascertain exact progression, there is some evidence for a similarity in the process of development in skills. 'Being able to work in a team of 2, 3 or 4', showed greatest improvement in the previous LPA, and 'playing with others' improved most in the home or school settings. Both require cooperation (in the general sense), which also improved most in the LPA Skills Set B (Table 4. Appendix K). Moreover, there is evidence that skills which developed more slowly throughout the previous LPA, also took longer to generalise. Table 16 indicates there was less improvement in the home or school settings in an ES skill (asking for help instead of getting upset, -7%) and a negotiation skill (discussing solutions to problems, -3%) both of which showed lowest improvement in the LPA (Table 4). Therefore, skills may generalise in a similar way from a developmental viewpoint, though future research would be required to provide further elucidation.

Though generalisation was expected, the proportionate difference in this generalisation was unexpected. It may simply have been due to parents being more positive. It may have been due to more opportunities for the use of skills outside the previous LPA setting. It may also have been that individuals were more familiar with the home or school environment (they attended the play scheme on a fortnightly basis), and had fewer new situations to deal with and more familiar people, allowing for the demonstration of abilities (resonating with research by Blanc, Adrien, Roux & Barthelemy, 2005). It may have been that the work on developing socio-communication skills within the LPA highlighted areas of limitation which were not as apparent in other settings. Data is not detailed enough to provide answers for this study. However, this does not preclude evidence that strategies were

not only adopted, but internal social and cognitive development occurred to an extent that skills were used in other settings, resonating with Murdock and Hobbs, 2011 research (ibid).

Considering attendance, boys who attended 5, 6 and 9 sessions, made similar progress as indicated in Table 1 (Appendix G). Boy 13 attended 5 sessions and achieved LDL. Boy 2 attended 6 sessions, and achieved LTL. Boy 11 attended 9 sessions and also achieved LTL. This shows attendance did not obviously influence outcomes in this study in terms of play levels achieved between boys. However, a longer period of time may make attendance more significant in terms of developing the more advanced skills as previously indicated. LeGoff & Sherman (2006) ensured that participants had completed LPA weekly sessions for at least 3 years in their study on longterm outcomes.

With regards to the LPA when considering the combination of Skills Sets A, B and C, it was possible to discern sequential patterns of development from Skills Sets A and B. The patterns of development generally followed neuro-typical patterns of development when Emotional Self-Regulation and Problem Solving were supported in conflict situations. These skills were reflected in individual abilities, though those abilities were not always demonstrated. Motivation as measured by Lego interest had a beneficial impact, though the motivation to make friends, in one particular case, may have been as important as the motivation resulting from a common interest in Lego. However, an interest in Lego could also have hindered progress. The patterns of development correlated to stages of progression through the LPA play levels and were in line with progress from parallel play to collaborative play, with opportunity for consolidation of skills at each stage. The acquisition of each separate skill progressed by degrees through play levels. The strategy of Problem Solving in the conflict situation may have enabled participants to progress to the point where incidents previously viewed as problems were no longer problems. Generalisation occurred, and skills were seen to have improved more in the home or school settings. A skill relating to cooperation was common in the skills which improved most, as observed by staff and parents/carers, and one relating to Conflict Resolution improved least.

6: Conclusions, Strengths, Limitations and Recommendations

In conclusion, on analysing the data sequential patterns of development in line with neuro-typical development were present. Though reflected in individual abilities, the demonstration of these abilities was not always apparent, which may have been due to various external and internal factors. When motivated, individuals not only made progress, but also demonstrated their abilities, therefore motivation was reflected in patterns of development as were stages of progression through the LPA play levels. Notably, though an interest in Lego was beneficial, an affiliative motivation to play with peers may also have been required. Support was necessary for Conflict Resolution/Emotional Self-regulation and Problem Solving at all play levels, which enabled development to occur, though the exact role of CR was unknown. Degrees of skill increased in association with advancement through the play levels and the ability to integrate skills was highlighted. At lower play levels more skills were supported as some of the advanced skills began to emerge along with the improvement of more basic and underlying skills. Consolidation was required at each level of play, and the interplay of the skills development process was apparent. Assessment of individual abilities was necessary to determine individual targets and place peers of similar abilities together to gain increased development. In addition progress generalised to the home or school settings and in this study has been demonstrated more in these settings. In this case, attendance did not obviously influence outcomes.

Strengths of this research include the fact that the researcher was involved in the data collection methods for the previous intervention project, which was run over 6 months. Data was collected mainly by staff, avoiding researcher subjectivity, from 9 sources and involved children participating in the previous intervention project, staff, who were trained by the researcher, and the children's parents/carers.

Limitations of this research were the lack of data on initial abilities, and limited data on conflict resolution skills. However, a baseline measure was taken in the first session to give an indication of ability level.

Future research could determine the exact role of conflict resolution within the LPA, the need for an affiliative motivation for progress to be made, and examine different socio-communication skills. A more detailed analysis

of the interplay of skills in the developmental process, and the development of skills into other settings could also be undertaken.

Recommendations from this research are that initial abilities of participants should be determined in order to individualise progress targets for participants within the LPA. In addition Lego teams should include members of similar ability unless leadership skills are being developed. If possible participants should have an interest in Lego and a desire to interact with peers in order to provide motivation. Opportunity should be provided for consolidation of skills as necessary, and the number of sessions arranged should be at least 10 to allow for the development of more advanced skills.

Appendix A: Lego Levels Chart

	Achieved Stickers
Name:	
Level 5 Lego Genius I can • create a sequence or story with my group and • direct the sequence or story and • listen to the group's ideas, explain my own ideas and negotiate a final idea.	
Level 4 Lego Master I can • jointly create a freestyle model with another group member and • listen to the group and agree on a final model.	
Level 3 Lego Designer I can • create a freestyle Lego model and • clearly explain my ideas to my team.	
Level 2 Lego Teamer I can • be a Builder, a Supplier and an Engineer and • wait and listen to team members.	
Level 1 Lego Worker I can • work with Lego • work with Lego with another person.	

Appendix B: Tick Sheet including Staff Comments

Tick Sheet
Name: _____   **Date**: _____
Please circle the behaviour which best fits the behaviour you have observed throughout the, "Lego Time" and then add any comments at the end (e.g. "he needed support for this all the way through")
Joint Play: • Not playing with a peer. • Playing alongside a peer. • Playing with a peer for some of the time. • Playing with a peer for most of the time. • Playing with a peer for all of the time.
Co-operation: • No co-operation with a peer. • Co-operating with a peer through trying to do what has been asked. • Co-operating with a peer through doing what has been asked and asking for clarification when necessary. • Co-operating with a peer through doing what has been asked, asking for clarification and occasionally suggesting ways of developing the idea. • Co-operating with a peer through doing what has been asked, asking for clarification and continually working with them to build an idea together.
Conflict Resolution: • Unable to go through conflict resolution process. • Can go through steps 2 and 3 of process. • Can go through steps 2, 3, 5 and 6 of process. • Can go through steps 2, 3, 4, 5 and 6 of process. • Can go through all of process. **Conflict Resolution Process**: • 1. Calmly identify a problem with support. • 2. Calmly give problem solving ideas in turn. • 3. Listen to each idea and work out the advantages and disadvantages of each. • 4. Negotiate with peers to decide which one to choose. • 5. Try it out and see if it works. • 6. If it works accept it, if not look at the other ideas and go back to step 2 or 4.
Interpersonal Engagement Within Task indicated by Joint Focus and Response: • Unable to jointly focus. • Able to jointly focus and respond to instructions. • Able to jointly focus and respond to instructions and non-verbal communication. • Able to jointly focus and respond to instructions and verbal communication. • Able to jointly focus and respond to instructions, verbal and non-verbal communication.
Comments:

Appendix C: Staff Evaluation Form

<u>Staff Evaluation Form</u>

Below is a list of the skills we have been working on during the Lego Sessions. I would be grateful if you could make any comments about changes you have seen in these skills in the boys, either during the sessions or outwith the sessions. Please identify the boy and note how the skill has changed (e.g. Toni is now making requests). Please add any further comments you wish to make. Thank you for all your help and cooperation. It is very much appreciated.

Taking a turn.
Staying calm when faced with a problem.
Thinking up solutions to problems.
Discussing solutions to problems.
Deciding on the best solution and accepting it, even if it wasn't 'my' solution.
Asking for help instead of getting upset.
Being able to work in a team of 2, 3 or 4.
Listening better.
Explaining ideas.
Being focussed on the task.
Trying things out.
Following instructions.
Concentrating for longer.
Playing with others.
Being part of a big group.

<u>Comments</u>

Appendix D: Previous Intervention Project Procedure

The Intervention took place with boys aged between 5 and 12 yrs. All had a diagnosis of ASD and were chosen as individuals who would benefit from participation in the LPA. There were 12 members of staff and 14 parents/carers. The boys were split between 2 groups which met fortnightly for 9 sessions with a gap of 6 weeks over the summer. Every Session consisted of Group Time, Lego Building Time, Snack Time and, Play Time. The majority of each session took place in a Lego Room, with the Snack Time in a separate hall and the last 15 minutes of the Play time between the Lego Room and the hall. Staff, who had received training from the researcher on the LPA procedure, on the completion of the Tick Sheets, the Lego Play Levels Charts and the Individual Target Sheets, were involved in facilitating the intervention..

Group Time included a gathering time and the following

- Choosing a Group Name (1st session).
- Rule setting (1st session).
- Rule reminders.
- Short interactive teaching on skills.
- Skill reminders.
- Discussions of any problems.
- News.
- Sticker rewards for completing Lego play levels.
- Team choosing.

In Session 1 information on how the evening would run, what the rules and roles were, and how to make up a team were also explained.

NB. Children were moved through Lego play levels on the basis of achieving each level in Skills Set A as noted in the Lego Levels Chart. Having achieved a level they were then noted to be working on the skills at the next level.

Lego Time included

- Choosing a kit.
- Building with the kit in the roles of, 'Engineer', 'Builder' and 'Supplier'.

One of the staff sat with each team, supporting them as necessary. Where an individual was unable to tolerate a peer, but could work with a member of staff, the staff member took on a role. On occasions where there were fewer than 3 members in a team, either 1 member adopted 2 roles or the members asked the staff member to adopt a role.

Snack Time included

- Sitting at a table in another hall and having a snack together.
- 5 mins to run around.

This was a time in the middle of the LPA for the children to unwind, so no work was carried out.

Play Time included

- Free play in the Lego room with Lego.
- Free play in the hall with either Lego or some of the charity's toys and games.

Though each child was encouraged to take part even if it was simply to observe, they were also given the choice of opting out.

There were no opportunities for individual sessions.

Appendix E: Individual Target Sheets and Achievement Observation from Staff

Name:
Target:
Comments:

Appendix F: Parent/Carer Feedback Form

October 2011

Dear Parent/Guardian,

I have enjoyed working with the children in the Lego Sessions over the past few months and have been very grateful for your co-operation in encouraging the boys to take part. Having now completed the Sessions I have listed below the things we have been working on. I have listed everything though we have worked with each child depending on their needs. It would be helpful if you could tick any areas where you have seen any improvement at home, or where the school may have mentioned they've noted an improvement (please tick all that apply). I have also provided a space for any additional comments you may wish to make.

Thank you for the opportunity to work with your child/children.

Yours faithfully

June Grindley
Autism Practitioner

We have been working on:

	Ticks
Taking a turn.	
Staying calm when faced with a problem.	
Thinking up solutions to problems.	
Discussing solutions to problems.	
Deciding on the best solution and accepting it, even if it wasn't 'my' solution.	
Asking for help instead of getting upset.	
Being able to work in a team of 2, 3 or 4.	
Listening better.	
Explaining ideas.	
Being focussed on the task.	
Trying things out.	
Following instructions.	
Concentrating for longer.	
Playing with others.	
Being part of a big group.	

Comments

Appendix G: Table 1: Area of Interest by Lego Play Level Achieved by Session Attendance

Boy	Area of Interest	Lego Play Level Achieved	Number of Sessions Attended
Boy 1	Other	Lego Worker	7
Boy 2	Other	Lego Teamer	6
Boy 3	Lego	Lego Designer	6
Boy 4	Lego	Lego Worker	5
Boy 5	Lego	Lego Designer	6
Boy 6	Other	Lego Teamer	6
Boy 7	Other	Lego Designer	5
Boy 8	Lego	Lego Designer	9
Boy 9	Lego	Lego Designer	8
Boy 10	Other	Lego Designer	6
Boy 11	No Record	Lego Teamer	9
Boy 12	Lego	Lego Designer	6
Boy 13	Other	Lego Designer	5
Boy 14	Other	Lego Teamer	9

Appendix H: Table 2: Additional Comments for Lego Interest

Boy	Additional Comments
Boy 1	keen to engage during the Lego Time. (Researcher's Report, Session 4).
Boy 2	had not realised the Lego Sessions were continuing and was not keen to participate tonight, though agreed to try. (Researcher's Report, Session 5). had a great time building (Tick Sheets, Session 9).
Boy 3	really enjoys playing with the Lego, is very motivated and is eager to take part in all that is going on. (Researcher's Report, Session 2). Loves to play with Lego. He can build the most amazing things just from the top of his head.. he plays with his Lego alone.. he does not like anyone messing up his Lego. He will play quite well with friends and family when Lego is not involved. (Social Play Record Home Comments Sheet, White, 2006)
Boy 4	plays with Lego all the time at home. (Diary). very good at building the models (Tick Sheets: Session 3). He is very able when building himself (Tick Sheets: Session 9).
Boy 5	was very eager to participate but was frustrated by the lack of interest his group members showed. (Researcher's Report, Session 4).
Boy 7	when asked if he tried harder to get to next level he said he didn't as didn't like Lego. (Staff Evaluation Form)
Boy 9	loves Lego. His obsessions are… and Lego (Social Play Record Home Comments Sheet, White, 2006).
Boy 14	Seems to really enjoy the sessions, especially being creative with the bricks at play time. (Tick Sheets: Session 3).

Appendix I: Table 3: Socio-Communication Skills Development

Lego Levels	Socio-Communication Skills (Working On)	Socio-Communication Skills (Achieved)	Skills Set A (Achieved)
Lego Worker (1st Level)	• JP: Tolerating working with an adult or peer. • IE: Ability to have a joint focus. Continuous adult support.	• All • Used as a base level. Everyone except 1 boy worked in a team with peers. • Continuous adult support necessary to learn LPA process.	Can • Work with Lego. • Work with Lego with another person.
NB		Boy 4 worked 1-1 with an adult after trying to work in a team. Boy 10 worked 1-1 with an adult.	
Lego Teamer (2nd Level)	• JP: Tolerating being part of a team with 2 other people. Initially 1 adult, 1 child, then 2 children. Also increasing the length of joint play time. • Turn-taking in Lego building. • Role taking. • Role transition. • IE: jointly focussing and responding to direct verbal and non-verbal cues. Extending length of time and intensity of joint focus • Waiting and listening to others within the Lego	• Able to be part of a team of 3, but could be 2 children and 1 adult. • Didn't all achieve extending length of time and intensity of focus, but both skills good enough to move on to Lego Designer. • All other skills achieved. • CR and PS: calming down when upset, PS and listening to others' ideas, negotiation and compromise required much support. • Occupying oneself during,	Can • Be a Builder, a Supplier and an Engineer. • Wait and listen to team members.

Lego Levels	Socio-Communication Skills (Working On)	Socio-Communication Skills (Achieved)	Skills Set A (Achieved)
	process. • Shared goal understanding: ability to understand the team is working towards a common goal and trying to do that. • CR and PS: calming down when upset, PS, listening to others' ideas, negotiating and compromising. • Occupying oneself during 'waiting time' in "Supplier" Role. All with significant adult support.	'waiting time in "Supplier" Role also required much support. All with significant adult support.	
Lego Designer (3rd Level)	• Initial consolidation of 'Lego Teamer' skills. Moved on to: • Shared goal understanding: how to clearly explain one's idea and persuade people to participate in building it. • CR: calming down, turn-taking, listening, negotiating and compromising. • IE: jointly focussing and responding. • Cpn: asking for clarification and occasionally suggesting ways of developing the idea. • Generalisation beginning to	• All as expected except: • CR and PS: accomplished to varying degrees, but still requiring much support. • Some boys had started recognising when others needed help and were offering it. • Generalisation happening with some of the boys into Snack Time. • Not all skills completely consolidated.	Can • Create a freestyle Lego model. • Clearly explain my ideas to my team.

Lego Levels	Socio-Communication Skills (Working On)	Socio-Communication Skills (Achieved)	Skills Set A (Achieved)
	be encouraged into Group Time from Lego Building Time. • A bit of adult support.		
Lego Master (4th Level)	No one completed this level, but work was being done on • Consolidation of 'Lego Designer' skills. Moving on to: • Increasing use of IE without support. • CR and PS: calming down by oneself and using negotiation and compromise within the 'Lego Time', with support • Recognising when other's need help and offering it, with support. • Flexibility in unwritten rules of play, with support.	No one completed this level, but the following was seen in some of the boys: • Increased IE without support. • CR and PS: remaining calm when a problem arose; things that would have been problems and caused internal conflict were no longer seen as problems in some cases, though much support still required when conflicts arose. • Recognising when other's need help and offering it, with support. • Flexibility in unwritten rules of play.	Can • Jointly create a freestyle model with another group member. • Listen to the group and agree on a final model.
Lego Genius (5th Level)	No results as no one reached this level.	No results as no one reached this level.	Can • Create a sequence or story with my group. • Direct the sequence or story. • Listen to the group's ideas, explain my own ideas and negotiate a final idea.

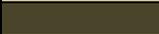**Appendix J: Colour-coded Skills Ratings by Individual Keys**

<u>Joint Play</u>

Grid 2: Key: Joint Play

A	Absent
OO	Opted out of the Lego Time.
NR	No Record
Lego Worker (LW)	Working with Lego and with another person, either an adult or a child.
Lego Teamer (LT)	Working at taking on each role and waiting and listening to team members who are children.
Lego Designer (LD)	Working at creating a freestyle model and clearly explaining ideas to the team who are children.
Lego Master (LM)	Working at jointly creating a freestyle model with another child team member, listening to the team and agreeing on a final model.
Lego Genius (LG)	Working at creating a sequence or story with the team; explaining the ideas, listening to the team's ideas, negotiating a final idea and directing the sequence or story.
	1-1 with an adult, not part of a team.
	Chose to work completely alone.
	Not playing with a peer/adult, but tolerating their presence.
	Playing alongside a peer/adult, receiving prompts for all joint play.
	Playing with a peer/adult for some of the time.
	Playing with a peer/adult for most of the time.
	Playing with a peer/adult for all of the time.
I	Any improvement was noted after the first session attended.
V	The rating moved up and down over different sessions without improving after the first session.
S	The rating stayed at the same level.
D	The rating trend over sessions indicated a definite decline after the first session.

<u>Interpersonal Engagement</u>

Grid 3: Key: Interpersonal Engagement

A	Absent
OO	Opted out of the Lego Time.
NR	No Record
Lego Worker (LW)	Working with Lego and with another person, either an adult or a child.
Lego Teamer (LT)	Working at taking on each role and waiting and listening to team members who are children.

Lego Designer (LD)	Working at creating a freestyle model and clearly explaining ideas to the team who are children.
Lego Master (LM)	Working at jointly creating a freestyle model with another child team member, listening to the team and agreeing on a final model.
Lego Genius (LG)	Working at creating a sequence or story with the team; explaining the ideas, listening to the team's ideas, negotiating a final idea and directing the sequence or story.
	1-1 with an adult, not part of a team.
	Chose to work completely alone.
	Not jointly focussing and responding.
	Jointly focussing and responding with significant support.
	Jointly focussing and responding with a bit of support.
	Jointly focussing and responding with no support.
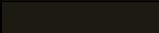
Cooperation

Grid 4: Key: Cooperation

A	Absent
OO	Opted out of the Lego Time.
NR	No Record
Lego Worker (LW)	Working with Lego and with another person, either an adult or a child.
Lego Teamer (LT)	Working at taking on each role and waiting and listening to team members who are children.
Lego Designer (LD)	Working at creating a freestyle model and clearly explaining ideas to the team who are children.
Lego Master (LM)	Working at jointly creating a freestyle model with another child team member, listening to the team and agreeing on a final model.
Lego Genius (LG)	Working at creating a sequence or story with the team; explaining the ideas, listening to the team's ideas, negotiating a final idea and directing the sequence or story.
	1-1 with an adult, not part of a team.
	Chose to work completely alone.
	No co-operation with a peer.
	Co-operating with a peer through trying to do what has been asked.
	Co-operating with a peer through doing what has been asked and asking for clarification when necessary.
	Co-operating with a peer through doing what has been asked, asking for clarification and occasionally suggesting ways of developing the idea.
	Co-operating with a peer through doing what has been asked, asking for clarification and continually working with them to build an idea together.

Conflict Resolution

Grid 5: Key: Conflict Resolution

A	Absent.
OO	Opted out of the Lego Time.
NP	No problems.
U	Unable to enter into problem solving process.
TL	Could offer solutions and listen in turn.
NC	Could take part in negotiations and compromise.
NR	No Record.
▫	In for Group Time.
Lego Worker (LW)	Working with Lego and with another person, either an adult or a child.
Lego Teamer (LT)	Working at taking on each role and waiting and listening to team members who are children.
Lego Designer (LD)	Working at creating a freestyle model and clearly explaining ideas to the team who are children.
Lego Master (LM)	Working at jointly creating a freestyle model with another child team member, listening to the team and agreeing on a final model.
Lego Genius (LG)	Working at creating a sequence or story with the team; explaining the ideas, listening to the team's ideas, negotiating a final idea and directing the sequence or story.
▨	1-1 with an adult, not part of a team.
▥	Chose to work completely alone.
🟥	Got upset, entered a conflict situation and had to be distracted when a problem arose.
🟧	Was able to calm down with support when a problem arose which led to either internal or external conflict.
🟩	Calmed down on own when a problem arose which led to either internal or external conflict.
🟢	Remained calm when a problem arose and did not enter into any conflict.
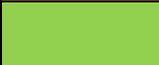
Grid 2: Key: Colour-Coded Totals

I	Improved
V	Variable
S	Stayed the Same
D	Declined
△	Started at top rating
□	Started at 4th rating out of 5
✿	Started at 3rd rating out of 4

Table 4: Colour-Coded Ratings Totals

Boy	Joint Play				Interpersonal Engagement				Cooperation				Conflict Resolution							
													Emotional Self-regulation				Problem Solving			
1	V				I				I				I				I			
2	I				I				I				D				D			
3	I □				I ✿				I □				I ✿				I			
4	V				V				I				I				I			
5	V □				D△				D△				D ✿				D△			
6	I				I				I				I				I			
7	I				D△				I □				S ✿				I			
8	I □				V△				I				V△				I			
9	V □				V△				I				V△				D△			
10	I				I				I				I				I			
11	I				I				I				D△				S			
12	V □				D△				I				V				NR			
13	I				I ✿				I				D△				V			
14	I				I				I				D△				S			
													(E)				(PS)			
	I	V	S	D	I	V	S	D	I	V	S	D	I	V	S	D	I	V	S	D	NR
Totals	9 (2□)	5 (3□)	0	0	8 (2✿)	3 (2△)	0	3 (3△)	13 (2□)	0	0	1 (1△)	5 (1✿)	3 (2△)	1 (1✿)	5 (3△)	7	1	2	3 (2△)	1

Appendix L: Additional Comments Tables for Joint Play, Interpersonal Engagement, Cooperation and Conflict Resolution

Table 5: Additional Comments for Joint Play by Individual

Boy	Comments
Boy 1	difficulty committing to the task in hand for any length of time. (Tick Sheets: Session 1). not working in a team this week, though able to, but other boys find it too frustrating as he is not at a similar level of functioning…. the other boys need to be able to work at their level… (Researcher's Report: Session 2).
Boy 2	would not join a group to play with this week…. He finds it difficult to compromise and can't seem to peacefully work within a group. (Tick Sheets: Session 6). played with at least 1 peer for all of the time. (Tick Sheets: Session 7).
Boy 3	had a great session, played with his peers for all of the time. (Tick Sheets: Session 9).
Boy 4	(plays) mostly alone… no social skills really…. Just learning to take turns (Social Play Record Home Comments Sheet. (White, 2006)). agreed to work in a team, but they could not decide on a kit together, so each worked on different kits with an adult. (Tick Sheets: Session 3). Attempted to work as part of a team but preferred to work alone. (Individual Target Sheet: Session 5).
Boy 7	did not want to do Lego tonight. Only participated in Lego for a short period. (Tick Sheets: Session 9).
Boy 10	his Mum said it's not good at school just now and he'll be moving school. (reason given by his Mum for his unsettled behaviour.) (Tick Sheets: Session 4). He worked well in the team. (He'd moved school). (Tick Sheets: Session 5). is able to… work with his peers but he chooses not to. (Tick Sheets: Session 9).

Table 6: Additional Comments for Interpersonal Engagement by Individual

Boys	Additional Comments
Boy 1	participated with a lot of support (Tick Sheets: Session 1). requires lots of support to stay focussed.. (Researcher's Report: Session 2). focussed more tonight and listened to others (Tick Sheets: Session 9).
Boy 7	only participated in Lego for a short period…. didn't want to do Lego tonight. (Tick Sheets: Session 9)
Boy 9	sometimes misunderstood the instructions and got frustrated. He required a lot of support to work through this, however when he felt he was getting too upset he decided to take time away from his team to see what other teams were doing. (Researcher's Report: Session 3)
Boy 11	not able to (demonstrate interpersonal engagement) as paired with child who could not concentrate for long enough. (Tick Sheets: Session

Boys	Additional Comments
	4).
Boy 12	(top rating) for a short period of time (Tick Sheets: Session 1). loses interest quite quickly and tends to do his own thing…. worked well when giving instructions.. and also shared ideas (Tick Sheets: Session 6).
Boy 13	lack of interest… needed reminding to participate. (Tick Sheets: Session 5).

Table 7: Additional Comments for Cooperation by Individual

Boys	Additional Comments
Boy 2	would not join a group to play with this week. (Tick Sheets: Session 6).
Boy 4	much improved from last week although still finding it difficult cooperating with others. (Tick Sheets: Session 8) (worked with an adult) still does not enjoy cooperating with the others. (Tick Sheets: Session 9).
Boy 5	cooperating with a peer through trying to do what has been asked. (With reference to free play time) (Tick Sheets: Session 2). He could work on listening to others' ideas a little more instead of going along with his own. (Lego Time) (Tick Sheets: Session 2).
Boy 10	Needed to make compromises with him to encourage him to take part. (Tick Sheets: Session 1). did an excellent job at designing his own model, providing great ideas for the group to build. He also listened really well when it was (Boy 14's) turn to design, and built the model as (Boy 14) wanted and not as he wanted. (Tick Sheets: Session 6). would rather play on his own. (Tick Sheets: Session 9).
Boy 11	He became a little agitated when it was his turn to design as he struggled to suggest ideas.. (Session 6). He worked with Boy 14 for the first 10 mins, but then wanted to build (on) his own.. made an excellent Lego train using his own ideas (Session 8). (was) expressing his ideas on what he has made.(Session 9).
Boy 14	performed great…. when it was his turn to design, telling (other boys)... exactly where he wanted the Lego pieces to go. (Tick Sheets: Session 6) moved to Lego Designer Level by accident because the rest of his team were at that play level. (Researcher's Report: Session 6).

Table 8: Additional Comments for Conflict Resolution by Individual

Boy	Additional Comments
Boy 1	not working in a team this week, though able to, but other boys find it too frustrating as he is not at a similar level of functioning…. the other boys need to be able to work at their level… (Researcher's Report: Session 2)
Boy 2	would not join a group to play with this week…. He finds it difficult to compromise and can't seem to peacefully work within a group. (Tick Sheets: Session 6).

Boy	Additional Comments
Boy 3	got too ahead of the group. Only likes doing tasks he wants to do. (Tick Sheets: Session 1). works well in team. Good at explaining ideas. Sometimes takes control of all roles as he is very able and good with Lego. (Tick Sheets: Session 5) had a great session, played with his peers for all of the time. At play time he played alongside his peers with what they had built. (Tick Sheets: Session 9).
Boy 4	agreed to work in a team, but they could not decide on a kit together, so each worked on different kits with an adult. (Distraction strategy employed to help him calm down). (Tick Sheets: Session 3). He is very able when building himself but finds it difficult to compromise. (Tick Sheets: Session 9)
Boy 5	was very eager to participate but was frustrated by the lack of interest his group members showed. (Researcher's Report, Session 4).
Boy 6	difficulty deciding on a kit… (Tick Sheets: Session 1). he needed some assistance whilst putting parts together and asked his workmates. (Tick Sheets: Session 2). lost a bit of interest before tuck time (Tick Sheets: Session 4). likes to be in charge (Tick Sheets: Session 9).
Boy 7	very patient with other members. (Tick Sheets: Session 7)
Boy 9	needs lots of support for roles keeping… went through problem solving process very calmly. (Tick Sheets: Session 2). sometimes misunderstood the instructions and got frustrated. He required a lot of support to work through this, however when he felt he was getting too upset he decided to take time away from his team to see what other teams were doing. (Researcher's Report: Session 3) needs to try and remain calm when the pieces don't fit, struggled taking part when choosing a role, he wanted to do all three. When he calmed down he took time to think about it. He agreed to work with his partner. (Tick Sheets: Session 5). Did really well… but at times struggles to share and tries to do all roles himself. (Tick Sheets: Session 7). worked well with his peers, building a car (Tick Sheets: Session 9).
Boy 11	was getting very upset and down very quickly when it got harder. (Individual Target Sheet: Session 5). He became a little agitated when it was his turn to design as he struggled to suggest ideas.. (Tick Sheets: Session 6).

Table 9: Joint Play Frequency Distribution

	Lego Worker	%	Lego Teamer	%	Lego Designer	%	Lego Master	%	Lego Genius	%	Total
None	0	(0%)	□*□*□*□□ □ 6	(55%)	□*□□ 3	(27%)	□*□* 2	(18%)	N/A	(N/A)	11 (100%)
Playing alongside a peer/adult with prompts	2	(20%)	5	(50%)	2	(20%)	1	(10%)	N/A	(N/A)	10 (100%)
Playing alongside a peer/adult some of the time	■*■■■■■ ■ 7	(21%)	■*■*■*■*■ ■■■■■■■ 13	(39%)	■■■■■■■■ ■ 9	(27%)	■■■■ 4	(12%)	N/A	(N/A)	33 (100%)
Playing alongside a peer/adult most of the time	■■■■■ 5	(17%)	■■■■■■■■ ■■ 10	(33%)	■■■■■■■ 7	(23%)	■■■■■■■■ 8	(27%)	N/A	(N/A)	30 (100%)
Playing alongside a peer/adult all of the time	0	(0%)	■■■ 3	(30%)	■■■■ 4	(40%)	■■■ 3	(30%)	N/A	(N/A)	10 (100%)
*- working 1 to 1 with an adult or alone											

Table 10: Interpersonal Engagement Frequency Distribution

	Lego Worker	%	Lego Teamer	%	Lego Designer	%	Lego Master	%	Lego Genius	%	Total
Not jointly focussing and responding	0	(0%)	☐☐☐☐☐ 5	(50%)	☐☐☐☐☐ 5	(50%)	0	(0%)	N/A	(N/A)	10 (100%)
Jointly focussing and responding with significant support	■*■■■■■ ■ 7	(22%)	■*■*■*■*■* ■■■■■■■■■ 14	(44%)	■*■■■■■■ 7	(22%)	■*■■■ 4	(13%)	N/A	(N/A)	32 (100%)
Jointly focussing and responding with a bit of support	■■ 2	(7%)	■*■*■■■■■ ■■■■■■ 13	(45%)	■■■■■■■ 7	(24%)	■■■■■■■ 7	(24%)	N/A	(N/A)	29 (100%)
Jointly focussing and responding with no support	■■■■■ 5	(22%)	■■■■■ 5	(22%)	■■■■■■ 6	(26%)	■*■■■■■ ■ 7	(30%)	N/A	(N/A)	23 (100%)
*- working 1 to 1 with an adult or alone.											

Table 11: Cooperation Frequency Distribution

	Lego Worker	%	Lego Teamer	%	Lego Designer	%	Lego Master	%	Lego Genius	%	Total
None	□□ 2	(22%)	□*□□ 3	(33%)	□*□ 2	(22%)	□*□* 2	(22%)	N/A	(N/A)	9 (100%)
Trying to do what has been asked	■*■■ ■ ■■ 6	(23%)	■*■*■■■■ ■■■■■■ 13	(50%)	■■■■■■ 6	(23%)	■ 1	(4%)	N/A	(N/A)	26 (100%)
Doing what has been asked and asking for clarification	■■■ 3	(19%)	■*■*■■■■ ■■ 8	(50%)	■■ 2	(12%)	■■■ 3	(19%)	N/A	(N/A)	16 (100%)
Doing what has been asked, asking for clarification and making suggestions	■■ 2	(7%)	■*■*■■■■ ■■■■■ 12	(44%)	■■■■■■■■ ■ 9	(33%)	■■■■ 4	(15%)	N/A	(N/A)	27 (100%)
Doing what has been asked, asking for clarification and building an idea together	■ 1	(6%)	■ 1	(6%)	■■■■■■ 6	(38%)	■■■■■■■■ 8	(50%)	N/A	N/A	16 (100%)
*- working 1 to 1 with an adult or alone.											

Table 12: Conflict Resolution Frequency Distribution

Key	U – Unable to enter into problem solving process										
	TL – Able to turn-take and listen to suggestions										
	NC – Able to negotiate and compromise										
	NN – No need for problem solving skills										
	*- working 1 to 1 with an adult or alone										
	Lego Worker	%	Lego Teamer	%	Lego Designer	%	Lego Master	%	Lego Genius	%	Total
Upset and needed to be distracted	U ■*■■ ■ 4	(21%)	U ■*■*■* ■*■■ ■■■■ 10	(53%)	U ■*■■ 3	(16%)	U ■*■ 2	(11%)	N/A	(N/A)	19 (100%)
Calmed down with support	TL ■■■ 3 TL,NC 0	(8%)	TL ■*■*■* ■■■■ ■■■■ ■■■■ 15 TL,NC ■■ 2	(39%) (5%)	TL ■■■■ ■■■■ ■■ 10 TL,NC ■■■ 3	(26%) (8%)	TL ■■■■ 4 TL,NC ■ 1	(11%) (3)	N/A	(N/A)	38 (100%)
Calmed down on own	TL 0 TL,NC ■ 1	(0%) (33%)	TL 0 TL,NC ■ 1	(0%) (33%)	TL 0 TL,NC ■ 1	(0%) (33%)	TL 0 TL,NC 0	(0%) (0%)	N/A	(N/A)	3 (100%)
Remained calm	NN ■■■ ■■■ 6	(32%)	NN ■■■■ ■■■ 7	(37%)	NN ■■ 2	(11%)	NN ■■■ 4	(21%)	N/A	(N/A)	19 (100%)
No problem	0	(0%)	□□ 2	(14%)	□□□ □□ 5	(36%)	□*□□ □□□□ 7	(50%)	N/A	(N/A)	14 (100%)
No record	0	(0%)	0	(0%)	1	(100%)	0	(0%)	N/A	(N/A)	1

Appendix N: Additional Comments for Skills Set C

Table 13: Additional Comments for Skill Improvement by Staff Evaluation

Boy	Additional Comments
Boy 1	seems to have learned to listen to others more… has developed his ability to accept others' ideas… benefitted from working in a group… needed support.. but this helped him focus.
Boy 2	better at discussing solutions to problems and can agree on a strategy without getting too stressed out.
Boy 3	very good at Lego.. This meant that, initially, he became frustrated at others who could not match his ability… He started to cooperate with others a bit more. This cooperation though only extended to those of similar ability to himself.. was reluctant to move outside of that group.
Boy 9	we have noticed (Boy 9) is calmer now.
Boy 11	able to transfer skills.
Boy 14	gained more confidence enabling him to communicate more with his peers and adults.

Table 14: Additional Comments for Generalisation

Boy	Additional Comments
Boy 14	think Lego sessions are helping him.. he's asking for juice. He wouldn't have done that before.. (Session 3) That's the 1st time I've heard him speak. I wasn't sure if he was non-verbal (Session 3).

Table 15: Additional Comments for Parent/Carer Evaluations

Boy	Additional Comments
Boy 3	I have seen a big difference in him.
Boy 9	could do many of these things before, but I feel there is an improvement.
Boy 12	has been able to bring many of the traits listed above into school and everyday life.
Anonymous	has been working better with his peers at school and I think this has contributed to his progress.

Appendix O: Table 16: Comparison of Staff Evaluation Skills Improvement to Parent/Carer Evaluation

Skill	Percentage by Parent/Carer	Percentage by Staff	Difference
Taking a turn	73%	29%	44%
Listening better	64%	36%	28%
Explaining ideas	64%	21%	43%
Being focussed on a task	36%	36%	0%
Concentrating for longer	36%	7%	29%
Following instructions	45%	36%	9%
Trying things out	36%	36%	0%
Staying calm when faced with a problem	45%	36%	9%
Asking for help instead of getting upset	36%	43%	-7%
Thinking up solutions to problems	36%	21%	15%
Discussing solutions to problems	18%	21%	-3%
Deciding on the best solution and accepting it, even if it wasn't, "my" solution	27%	14%	13%
Being able to work in a team of 2,3 or 4	45%	43%	2%
Playing with others	73%	36%	37%
Being part of a group	45%	7%	38%

Acknowledgements

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