Intensity of Supervision and Outcome for Preschool Aged Children Receiving Early and

Intensive Behavioral Interventions: A Preliminary Study

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Abstract

This study asked whether intensity of supervision is associated with outcome in preschool aged children with autism ($N = 20$) who received intensive and early behavioral intervention. Intensity of supervision ranged from 2.9 to 7.8 hours per month per child. Results show a significant correlation between intensity of supervision and improvement in IQ. Thus, intensity of supervision was reliably associated with amount of IQ change between intake and follow-up. These findings add to existing literature by suggesting that intensity of supervision together with intensity of treatment, treatment method, and pre treatment functioning are variables that may affect outcome for children with autism who receive early and intensive behavioral intervention.

Key words: Autism, Supervision, Behavioral Treatment, ABA

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Research has indicated that children with autism receiving early and intensive

behavioral interventions may make significant gains on standardized measures of IQ,

language and adaptive functioning (Howlin, 2005). Although more research is needed and

some conflicting evidence exists, the variables found to affect outcome most reliably are (a)

treatment method (Cohen, Amerine-Dickens, & Smith, 2006; Eikeseth, Smith, Jahr, &

Eldevik, 2002, 2007; Eldevik, Eikeseth, Jahr, & Smith, 2006; Howard, Sparkman, Cohen,

Green, Stanislaw, 2005; Lovaas, 1987, see Eikeseth, in press for a review), (b) intensity of

intervention (Eldevik et al., 2006; Lovaas, 1987), and (c) children's level of functioning pre

treatment (Eikeseth et al., 2002, 2007; Eldevik et al., 2006; Harris & Handleman, 2000;

Hayward, Eikeseth, Gale, & Morgan, in press; Lovaas & Smith, 1988; Remington et al., 2007;

Sallows & Graupner, 2005).

The extent to which programs are supervised by a competent clinician is another

variable that may affect outcome. A competent supervisor is required to have knowledge of

advanced learning principles, which may be assessed through the Behavior Analysis

Certification Board Examination (www.bacb.com). In addition, extensive clinical experience

is required including experience of beginning, intermediate and advanced programs designed

to increase language, play, social, emotional, academic, and daily living skills. Moreover,

experience with different types of learners (e.g., auditory and visual learners, children

exhibiting overselective responding or extreme problem behaviors) is fundamental. So is

supervised experience in designing and implementing individualized programs and

knowledge of functional assessment and reinforcement procedures to reduce inappropriate

behavior. It is also desirable for a supervisor to have knowledge of local procedures for

assessing and providing for children with special educational needs, demonstrate competency

in clinical report writing, to show ability to develop rapport with parents, manage staff and to conduct performance evaluations. A procedure for assessing supervisors' competency was validated by Davis, Smith and Donahoe (2002), and included key skills outlined above.

Intensity of supervision varies considerably from one program to another, and depends on circumstances such as costs, availability of specialists in early and intensive behavioral intervention, or other logistical issues. Two studies have reported supervision, on average, every three months (Bibby, Eikeseth, Martin, Mudford, & Reeves, 2002; Magiati, Charman, & Howlin, 2007). Other studies have reported more frequent supervision such as up to 10 hours per week (Eikeseth et al. 2002, 2007).

The present study was designed to examine whether intensity of supervision is associated with outcome in preschool aged children with autism who receive intensive and early behavioral intervention. To do so, we assessed correlations between intensity of supervision and improvement in IQ, Visual Spatial IQ, and Adaptive Functioning.

Method

Participants

Participants were clients of UK Young Autism Project (UK YAP) which is the British replication site for the UCLA International Multi Site Young Autism Project, directed by Drs. O. Ivar Lovaas, University of California, Los Angeles and Tristram Smith, University of Rochester, New York. All children residing within specified locations, who joined UK YAP between Autumn of 1998 and Spring 2005 were included in the study if they met all of the following criteria: (a) a diagnosis of autism according to the ICD-10 criteria (World Health Organization, 1993); (b) chronological age at intake between 24 and 42 months; (c) absence of other severe medical conditions, as certified by a medical practitioner, (d) if they resided outside the catchment area for the Clinic based services (Hayward et al., in press). In the Hayward et al. (in press) study, two types of service were evaluated. This was the Intensive

Clinic Based service, where all treatment personnel including tutors, senior tutors and programme consultants were provided by UK YAP. The other was the Intensive Parent Managed service where intensive supervision by programme consultants was provided while tutors were recruited and managed by parents. Both groups received the same treatment, consultants were the same for both groups, and there were no statistical significant differences between the two groups on any of the intake or outcome measures (though both groups made significant improvement between intake and follow-up). Because supervision hours were constant across participants in the Clinic Based Group while it varied for the Parent Managed group, we used data form the Parent Managed Group to assess effects of supervision intensity.

Participants were diagnosed by independent agencies, and the diagnosis was confirmed by the Autism Diagnostic Interview – Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994). The participants in the present study are those in the "Intensive Parent Managed Treatment Group" described in details by Hayward et al. (in press).

Twenty-three participants (6 girls) entered the study. Two children left the study before data collection was completed, and hence, were excluded from data analysis. One child exhibited low rates of skill acquisition during the course of the study, and for this reason, intensity of supervision was increased to help ameliorate the problems. The child's intake age was 24 months, intake IQ was 66, intensity of supervision was 74 hours, and follow up IQ was 50. Because intensity of supervision was increased due to lack of skill acquisition, the child was excluded from data analysis. In no other cases did a child's learning rate significantly affect the intensity of supervision. Intake and follow-up chronological age and standard scores or mental age scores are exhibited in Table 1.

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Insert Table 1 about here

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Supervision

Data on supervision was obtained from clinical records and reflects the actual number of hours of supervision provided to each child. Each child had one consultant, and there was a total of 8 consultants working with this group of children. Consultants provided a minimum number of supervision sessions arranged on one of three frequencies: (a) three hours every three weeks; (b) four hours every four weeks; (c) six hours every six weeks. The majority of the supervision took place in the children's home or school during team meetings. The child, the parents and the tutors were present during these meetings. During the team meeting, the consultant and team analyzed data from the child's log book and actively worked with the child to review current programs, revise procedures to reduce aberrant behaviors, and to provide feedback on teaching competency. In addition, new programs and interventions were implemented and demonstrated. At the end of the supervision, consultants provided a written report detailing procedures and programs to be implemented. Occasionally, supervision took place during treatment sessions, during meetings with parents, school staff or other professionals involved with the child. The consultants were supervised by the directors of UK YAP through case meetings and direct clinical contact.

Consultants' minimum academic qualification was a relevant Bachelor's degree. Each consultant had a minimum of three years clinical experience as both tutor and senior tutor before being eligible for promotion. Extensive experience included different levels of the programme with different types of learners. Supervisors were required to complete an advanced course including advanced principles of ABA (Kazdin, 1994), a review of literature on the development of interventions and outcomes of ABA, research into other treatments for autism, and aspects of professionalism required by a programme consultant. They also had to demonstrate competency in all the principles, procedures and programmes required to run a child's program independently, show ability to develop rapport with parents, manage staff and

conduct performance evaluations and appraisals. Furthermore, supervisors posited knowledge of the special educational needs statutory assessment and statementing procedures; they had experience with annual review meetings; were competent in clinical report writing, and demonstrated good ethical conduct and knowledge of company management procedures.

Prior to promotion, supervisors were assessed on their abilities to select and to introduce new programs to a child they had not previously worked with. The supervisors reviewed the child's record before identifying programs to introduce in the following four areas: A program with a verbal instruction and verbal response, receptive language, expressive language and interactive play. The teaching session was videotaped and videotapes were then scored and approved by Dr. Smith from the UCLA Multi-site Young Autism Project. The procedure for this has been described in Davis et al. (2002).

Treatment

Treatment procedures have been described in detail by Hayward et al. (in press) and will only be summarized here. Treatment took place in the children's homes. Each child was assigned a minimum of two therapists to provide the one-to-one treatment. The intensity of intervention was, on average, 34.2 hours per week for 50 weeks of the year.

Parents were given a half-day course on ABA principles followed by several days of intensive hands-on-training which included using the principles throughout their child's daily life by the programme consultants. Training thereafter was provided during team meetings, supervision sessions, and tutor sessions.

The behavioral treatment was based on treatment manuals for the UCLA model of early intervention developed by Lovaas and colleagues.

Assessment

A psychologist with a license to administer psychological tests carried out all assessments. The examiners had extensive experience in assessing children with autism, were

independent of the study, and were not informed of the purpose of the study. Intellectual functioning was evaluated with the WPPSI-R (Wechsler, 1989) or Bayley Scales of Infant Development-Revised (Bayley, 1993). Visual spatial IQ was assessed using the Merrill-Palmer Scale of Mental Tests (Stutsman, 1948). Language functioning was assessed using the Reynell Developmental Language Scales (Edwards et al., 1997; Reynell & Gruber, 1990). Finally, Adaptive behaviors were assessed with the Vineland Adaptive Behavior Scales (Sparrow, Balla, & Cicchetti, 1984). See Hayward et al., in press for more details on assessment instruments and the assessment procedure.

Results

Table 1 exhibit intake and follow-up scores (including standard deviation and range) on Chronological age, IQ, Visual Spatial IQ, Reynell Comprehension, Reynell Expressive Language, and Vineland Adaptive Behavior Scales. As can be seen in Table 1, mean intake age for the 20 participants completing the study was 34.9 months ($SD = 5.7$). Follow-up assessment was conducted 14 months ($SD = 6.1$) after treatment began. Mean intake IQ was 54 ($SD = 15.1$); mean follow-up IQ was 71 ($SD = 22.1$).

Mean cumulative supervision intensity was 73.05 ($SD = 24.80$; range = 40 to 109.5). Mean intensity of supervision per child per month was 5.2 hours, and ranged from 2.9 to 7.8 hours.

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Insert Table 2 about here

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Pearson correlations were conducted to assess whether intensity of supervision was associated with changes in IQ scores, changes in visual-spatial IQ, and changes in adaptive scores between intake and follow-up. These data are exhibited in Table 2. As can be seen, correlation of intensity of supervision and changes in IQ scores was significant, with r (20) =

0.45, $p > 0.05$. Changes in IQ scores was also significantly correlated with intake visual-spatial IQ (r (18) = 0.63, $p > 0.01$). All other correlations were non-significant.

The estimated linear regression line is given by a constant term 1.237 (p = ns.) and a slope of 0,210 ($p < 0.05$). This might be interpreted as an estimated average gain of 0.21 IQ points for each hour of supervision, but as explained below, this latter finding must be interpreted with caution. There were no significant correlations between any of the pre-treatment variables and supervision intensity.

Figure 1 exhibits the linear regression line and the relation between intensity of supervision and IQ change between intake and follow-up for each of the participants.

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Insert Figure 1 about here

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Discussion

This study asked whether intensity of supervision is associated with outcome in preschool aged children with autism who received early and intensive behavioral intervention. Intensity of supervision ranged from 2.9 to 7.8 hours per month per child. Results show a significant correlation between intensity of supervision and change in IQ between intake and follow-up. Thus, intensity of supervision was reliably associated with amount of IQ change between intake and follow-up. Moreover, the estimated linear regression line suggests, on average, that participants made a gain of 0.21 IQ points for each hour of supervision they received. However, this latter finding must be interpreted with extreme caution. For example, the effect of supervision is probably not linear. That is, a relative low intensity in supervision may produce little or no benefit; a certain level of intensity may yield optimal effect, while increasing supervision beyond this point may add little benefit above the optimal level.

Moreover, what constitutes the optimal level may vary from child to child, and depend on child characteristics, parental involvement, and the competency of the tutors.

These findings add to existing literature by suggesting that intensity of supervision together with intensity of treatment, treatment method, and pre treatment functioning are variables that may affect outcome for children with autism who receive early and intensive behavioral intervention.

Insufficient intensity of supervision may explain, in part, why some studies have reported limited gains after early and intensive behavioral interventions (Bibby et al., 2002; Magiati et al., 2007). In both of those studies, supervision was provided, on average, every three months, as compared other studies which have reported weekly or bi-weekly supervision (Eikeseth et al., 2002, 2007; Lovaas, 1987; Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000).

Though the present study had certain strengths, such as uniform training of supervisors, independent and blind assessment, independent diagnosis confirmed by a reliable assessment instrument, and specific intake criteria, the study also had limitations which should be considered. Firstly, the present study is preliminary. To further examine the association between intensity of supervision and outcome, the study should be cross validated on a new sample. Secondly, the study had a relatively low number of participants. Larger N should be considered in future studies. Thirdly, the study is correlationl, and hence, can only identify an association between intensity of supervision and outcome. To determine the causal relationship between two variables, supervision and outcome must be studied experimentally, for example, by examining whether high versus low supervision intensity differentially affect outcome.

The present study reports an association between supervision intensity and outcome after 14 months of treatment. Research suggests that children may continue to make gains

during the second and third year of treatment (Cohen et al., 2006; Eikeseth et al., 2007; Howard et al., 2005; Sallows & Graupner, 2005). It is possible that the variation in supervision intensity will more greatly affect outcome during the second and third years of treatment, when the issues of social skill development and advanced behavior management become more individualized and complex. This possibility merits further research.

Although the study is exploratory, preliminary results suggest an association between intensity of supervision and outcome in preschool aged children with autism who receive intensive and early behavioral intervention.

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Table 1. Intake and Follow-up Chronological Age and Standard Scores or Mental Age Scores

(n=20)

Measures	Intake	F-up
	M	*M*
	(SD, Range)	*(SD, Range)*
Chronological age (months)	34.9	48.6
	(5.7, 28-42)	(6.1, 36-56)
IQ	54.2	70.7
	(15.1, 17-83)	(22.1, 30-117)
Visual Spatial IQ	76.1	82.8
	(18.2, nb-110)	(28.0, 40-130)
Reynell Comprehension[1]	20.7	28.9
	(2.8, nb-33)	(9.5, nb-51)
Reynell Expressive[1]	20.8	28.0
	(3.3, nb-35)	(7.6, nb-44)
Vineland Adaptive Behavior Scales	65.5	72.6
	(10.4, 53-93)	(17.3, 52-109)

Note: [1] mental age. nb = no basal

Table 2. Unprotected Pearson Correlations of Intake Scores and With Changes in Scores

	Intake Measures			
Change in Scores	Age	IQ	Visual-Spatial IQ	Vineland Composite
Supervision	-.10	.45*	.16	-.10
IQ	.03	.24	.03	.03
Visual-Spatial IQ	-.15	.63**	.26	-.30
Vineland Composite	.09	.38	.19	-.10

Note: * $p < .05$. ** $p < .01$.

Figure Caption

Figure 1. The x-axis shows number of hours of supervision and the y-axis shows IQ change

between intake and follow-up. Each dot represents one participant and the line represents the

linear regression line.

Figure 1