# Examination of Studies Targeting Social Skills with Pivotal Response Treatment[*]

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## Abstract

In early education, especially in effective teaching to children with autism spectrum disorders, the teaching methods which are applicable in natural settings like pivotal response treatment (PRT) are commonly used. It is one of the naturalistic intervention models aiming to facilitate the stimulant-response generalization, decrease the dependency on cues and increase the motivation of the individual. Interventions with PRT are derived from the principles of Applied Behavior Analysis (ABA). By identifying and targeting pivotal skills, which can be critical in the achievement of many areas, developers of this treatment intended to result in improvements in other areas that are not specifically targeted. Accordingly, primary areas of PRT are; (i) motivation, (ii) responsivity to multiple cues, (iii) self-management, (iv) self-initiations and (v) empathy. The purpose of this study is to examine the studies targeting social skills with the use of PRT. The study is a qualitative analysis of other studies. Studies are analyzed according to the criteria set by the researchers. 23 studies obtained meeting the pre-set criteria. Examining the social skills targeted, 35% of the studies were on play initiations, 35% were on initiating conversations and social interactions and 13% were on initiating and continuation of joint attention. In 70% of the studies, researchers explained the reason for choosing the specific social skills they have targeted. Information on social validity was present in only 25% of the studies, which is far below the usual for studies focusing on the improvement of social skills.

## Key Words

Autism, Social Skills, Social Competence, Pivotal Response Treatment, Self-initiation, Responsivity to Multiple Cues.

Based on the fact that children with autism spectrum disorders (ASD) exhibit limited capability in skills like behavioral, social interaction and language acquisition (Camarata, Nelson, & Camarata, 1994; Oke & Schreibman, 1990; L. K. Koegel, Camarata, Valdez Menchaca, & Koegel, 1998; R. L. Koegel, Koegel, & Surratt, 1992), initiating joint attention (Charman et al., 1997; Mundy & Crowsan, 1997; Mundy & Gomes, 1996), play initiation, maintenance (Kohler, Strain, & Shearer, 1992; Stahmer, 1995) and generalization of knowledge to new environments (Burke & Cerniglia, 1990; L. K. Koegel & Koegel, 1995; Pierce, Glad & Schreibman, 1997), social skill deficiencies (Han & Kemple, 2006; Hauck, Fein, Waterhouse, & Feinstein, 1995; Mundy, Sigman, Ungerer, & Sherman, 1986) are especially observed in children with ASD. Therefore, social interactions and language acquisition of children with ASD has recently been the focus of the studies and the increase in the number of studies in this field is obvious.

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Elimination of social deficiencies requires a systematical social skills treatment for children with ASD (Begun, 1996). There are plenty of scientifically grounded applications to actualize the social skills treatment. Among these methods are incidental teaching, mand-model, time delay, activity-based teaching, peer tutoring, self-management, social stories, and pivotal response treatment. One of such applications is pivotal response treatment (PRT) (National Autism Center [NAC], 2009; National Professional Development Center on Autism Spectrum Disorders [NPDC], 2012; National Research Council [NRC], 2001). PRT is one of the naturalistic intervention models for autism which is developed by Koegel and friends derived from the principles of Applied Behavioral Analysis and Developmental Psychology (L. K. Koegel, Koegel, Harrower, & Carter, 1999; R. L. Koegel, Openden, Freedan, & Koegel, 2006), and advocating treatment to be at early ages, intense, with frequent intervals and take place in child's natural or natural-like environment and paying attention to participation of parents (Renshaw & Kuriakose, 2011; R. L. Koegel et al., 2006). Primary areas of PRT are; *(i)* motivation, *(ii)* responsivity to multiple cues, *(iii)* self-management, *(iv)* self-initiations and *(v)* empathy (R. L. Koegel & Koegel, 2006). However, because the 'Self-Management' is addressed as a distinct treatment based on a different scientific approach but not one of the areas of PRT in the 2009 Report of National Standards published by the American National Autism Center, only four primary areas of PRT are adopted in this review study.

One characteristic commonly associated with children with ASD is a lack of motivation during teaching and social interactions (L. K. Koegel & Koegel, 1995; Koegel & Koegel, 1986; R. L. Koegel, Koegel, & Carter, 1999). So, motivation is one of the main areas of PRT. Considerable research during the years has identified a specific attentional feature called overselectivity that is evident in many children with ASD. The term, overselectivity, refers to a problem in which children respond to an overly resricted portion of cues when learning to differentiate components of the environment (Lovaas, Schreibman, Koegel, & Rehm, 1971). Because an ability to respond to multiple cues significantly enhances learning and has general positive effects in a number of areas, we define responsivity to multiple cues as a pivotal response. The language characteristics of children with ASD often include low levels or the absence of question asking, apparent low levels of curiosity, and using language only to obtain desired items not to initiate

conversation, difficulties with nonverbal initiations or initiations of joint attention (Tager-Flusberg, 1996; Wetherby & Prutting, 1984). Hence, self-initiations appear to be pivotal.

A literature review reveals diverse studies on PRT. There were experimental (Baker-Ericzen, Stahmer, & Burns, 2007; Charman et al., 1997; Hauck et al., 1995; Hupp & Reitman, 2000; R. L. Koegel, Bimbela, & Schreibman, 1996; Minjarez, Williams, Mercier, & Hardan, 2011; Nefdt, Koegel, Singer, & Gerber, 2010; Presmanes, Walden, Stone, & Yoder, 2007; Schreibman, Kaneko & Koegel, 1991; Stahmer & Gist, 2001), qualitative (Sherer & Schreibman, 2005; Shukla, Surratt, Horner, & Albin, 1995), informative (Cowan & Allen, 2007; L. K. Koegel, Koegel, Harrower et al., 1999; Rogers, 2000; Stahmer, 1999; Terpstra, Higgins, & Pierce, 2002; Weiss & Harris, 2001) and qualitative (Sato, 2008) studies encountered in the literature. Also PRT were used for teaching academic skills (L. K. Koegel, Singh, & Koegel, 2010), reducing problem behaviors (R. L. Koegel, Koegel, & Surratt, 1992) and staff training (Bryson et. al., 2007). Existing studies provide information on applications of the method for families, implementers and researchers which may help them to get deeper knowledge on the method, to catch a sight of sample applications and to decide on the way they can design a treatment. Renshaw and Kuriakose (2011) provided an informative article on the basic concerns and sub-domains of the PRT based on the idea that the special education is teamwork. Stahmer, Suhrhenrich, Reed, Bolduc, and Schreibman (2010) explained the application steps of the PRT; exemplified applications on communication, language, social and academical activities. There is one review study relating to the PRT in the literature. The study was examined according to synthesis focuses on the effectiveness of PRT. Masiello (2007), claims about the effectiveness of PRT for improving the social-emotional and communicative behaviour outcomes of young children wih ASD. The study's sample was between 1988-2003 and comprised primarily of children age 6 and under 13 studies were included in this study. Included studies were analysed in participant, research model, characteristics of intervention and findings categories. Examining reseach design 12 studies employed single-subject designs an one study used retrospective analysis of archival data to examine pre-/post intervention outcomes. Child communicative and other behavioral outcomes measured in four studies, while seven studies measured social-emotional outcomes. The

settings in which PRT was delivered included the participants' schools or homes and university-based clinics. The practitioner implementing the PRT intervention was a typically devoloping peer, the experimenter or trained clinician, the participants parents, a trained graduate student or the participants teachers. Since the publication of this study in the literature, it was observerd a significant increase in the number of PRT research. This situation, teachers and researchers working in individuals with ASD have revealed the requirement in provide up to date information.

This review research is important in that; it is aimed to gather information on the design of the PRT on teaching social skills and present them in a single study, simplify individuals' work to reach required information who are interested in social skills and PRT, provide information to researchers and implementers on the conducted studies, un-dealt, ignored or partly studied areas of the subject, and shed light on future studies. The purpose of this study is to analyze the studies designed with PRT to teach social skills according to the following categories set by the research questions.

• What are the subject characteristics of the studies?

• Which settings used for teaching social skills in the studies?

• What are social skills to be taught (dependent–independent variables) and the reasons they are chosen?

• Which teaching settings took place in teaching social skills?

• What are the characteristics of the PRT implementers? To what extent are the treatments effective?

• What is the research model of the study?

• Did progress, monitoring and generalization, inter-observer reliabilities and application reliability reported? What are the figures?

• Did social validity data reported? By which procedure it is provided? Which aspects of social validity are covered by the provided information?

## Method

### Research Model

Th is study is a qualitative document analysis. Each document collected while working on a specifi c fi eld is a data source (Patton, 2002).

### Study Field

Specific criteria were taken into account when determining the studies to be analyzed in the scope of the present study. Preliminary criteria for determining the extent of this study included; studies should be conducted between 1980 and 2011, published in a peer-reviewed journal and used PRT as a primary variable. Total of 69 studies examined and 55% ($n$=38), of the studies appeared to be conducted with one of the single subject research methods. Included studies are PRT interventions on children aged between 0-9 and with autism spectrum disorders (ASD) and targeting social skills considering the target group is in need of support in areas like social, communication and play initiation skills most. In this review a total of 23 study were analyzed and this studies were indicated with an asterisk (*) in the references section.

### Data Collection

Electronic databases scanned (Academic Search Complete, Anadolu Üniversitesi Katoloğu, Cambridge Journals Online, Dissertation Abstracts International, Ebraray, Oxford Journals Online, Psychology ve Behavioral Science, Science Direct Journals, SocINDEX with Full Text, Springer LINK Contemporary, Taylor and Francis Journals, Wiley Black, Wilson Select Plus) automatically in order to reach the studies of interest. and the following journals were scanned manually [Journal of Applied Behavior Analysis (JABA), (1968-2011), Journal of Autism and Developmental Disorders (1990-2011), Focus on Autism and Other Developmental Disabilities (1990-2011), Education and Training in Developmental Disabilities (2001-2010), Topics in Early Childhood Special Education (1981-2011), Journal of Positive Behavior Interventon (1999-2011), Journal of Early Childhood Research (2003-2011)]. Th e following key words were used when scanning articles; autism, social skills, social competence, pivotal response treatment, self-initiation, responsivity to multiple cues.

### Data Analysis

Studies coded under 13 categories by the researchers; *(i)* the subjects and their features, *(ii)* the social skill targeted and the reason for being chosen, *(iii)* dependent variable, *(iv)* independent variable, *(v)* the atmosphere, *(vi)* the teaching setting, *(vii)* practitioner, *(viii)* research model *(ix)* progress, *(x)* monitoring, *(xi)* generalization, *(xii)*

reliability, *(xiii)* social validity data. All the data coded and analyzed under the related category.

The researchers read the studies independently according to the common categories formed; took the necessary notes; and made comments relating to the relevant category. Authors came together and recorded all data gathered from all categories in detail. These comments are discussed in the discussion section of this study with supporting references.

## Results

In this study, the results obtained from research related to pivotal response treatment for the teaching of social skills were explained in the relevant categories. In addition the obtained results were reported in detail together with the results given in tables. A brief analysis.of the studies with pivotal response teaching in teaching social skills to children with autism are shown in Table 1.

### Subjects and Their Characteristics

Genders of the subjects included in the studies were 51% males (*n*=60) and 16% females (*n*=19). Various assessment tools reported to be utilized in order to determine the performances of the subjects during the 'selecting the subjects' part of the researches. In order to diagnose the ASD, 61% (*n*=14) of the studies utilized the Turkish translation of the 'Diagnostic and Statistical Manual of Mental Disorders' (DSM-II-III-IV); 17% (*n*=4) of the studies utilized Stanford-Binet Intelligence Scales in order to determine the inferior intelligences of the subjects, 26% (*n*=6) of the studies utilized Peabody Picture Vocabulary Test in order to assess the language achievements of the subjects, 26% (*n*=6) of the studies utilized Vineland Adaptive Behavior Scale in order to assess the interactions of the subjects with adults and peers and the group-play and adaptation skills of the subjects.

### Selected Social Skills and Reasons for Selection

Th e studies were analyzed in terms of the social skill being taught. Examining the studies with respect to the targeted social skills; 35% of the studies targeted initiation of communication and social interaction skills, 35% targeted play skills, 13% targeted asking questions and answering and 13% targeted initiating and continuation of joint attention. Examining the reasons for the targeted social skills being chosen, 70% of the studies

reported that the subjects selected according to the observations and applied test results performances of the children.

### Dependent and Independent Variables

In this rewiev, the main dependent variable of all studies' is social skills and also initiation of communication and conversation, initiation of play, joint attention, joint attention initiations and maintenance ask question, answer question. Independent variable is PRT. 26% of the studies were on the effectiveness of the teaching methods applied together with PRT and 9% were comparison of PRT with other teaching methods on the social development of the subjects.

### Setting, Instruction Arrangement and Practitioner

All of the studies used various settings. Examining the settings in detail revealed that 35% of the studies were performed in clinical settings or general and special education classes, with addition of play rooms and play gardens to the 20% of the studies and houses to the 30% of the studies. 70% of the PRT applications on treating social skills discussed in this study were implemented with one-to-one settings; 17% of the study was implemented with small group settings, 4% of the study was implemented with group settings. Also 9% of the study were not indicated the type of implementation. 43% of the studies were implemented by the researcher/ clinician, 17% by a primary caretaker, 17% by both researcher and primary caretaker, 14% by peer, 5% by paraprofessional. In the study Coolican et al. (2010), no information was provided as to which practitioner was implemented.

### Research Model

Among the studies investigating the eff ectiveness of the pivotal response treatment in the teaching of social skills to individuals with ASD, 61% of the studies investigating the effectiveness of PRT were multiple baseline design across subject while 26% used multiple baseline design across, 9% used the AB design. In the study conducted by Lydon et al. (2011) no information was provided as to which research model was used.

**Maintenance and Generalization Process**: It was observed that in 57% of the studies planned maintenance and collected maintenance data. Examining the generalization of the studies

Table 1.
*A Brief Analysis of Studies with Pivotal Response Teaching in Teaching Social Skills to Children with Autism*

| Reference | Participant | Social Skills | Reasons for selection of social skills | Dependant Variable | Independent Variable | Setting | Instruction Arrangement | Practitioner | Design | Regression | Follow-up | Generalization | Reliability | Social validity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Robinson, 2011** | 4boy VABS | Initiating social communication | Performance-based | *Paraprofessional fidelity of implementation *Paraprofessional levels of involvement *Focal students' target social communication goals *Duration of training program | *PRT *Video Model | *Class *Play area | Small group | Paraprofessional | Multiple baseline design across participants | + | + 4-8 week | + *Person *Activity | + IOR | + |
| **Lydon, Healy, & Leader, 2011** | 5 boy *BAS-II *ABC *PPBS *DSM-IV -S-BIS | *Initiating pretend play *Play actions and verbalizations | Performance based | Play activities *Scripted play actions *Unscripted play actions Play verbalizations *Scripted verbalizations *Unscripted verbalizations | *PRT *Video model | Room | 1:1 | Researcher | No instruction | + | + | + Setting | + IOR | - |
| **Randolph, Stichter, Schmidt, & O'Connor, 2011** | 2 boy 1girl 1father-mother, 1 father, 1grand mother *DSM-IV | Self-initiation | No instruction | *Fidelity of implementation *Social-communication and play behaviors of the child | *PRT *PRT fidelity of implementation | Class | 1:1 | Care-giver | Multiple baseline design across participants | + | + 2 week | - | + IOR | + |
| **Coolican, Smith, & Bryson, 2010** | 7 boy 1girl 5 father 3mother *DSM-IV *PLS AC *PLS EC *DAS *WPSSI-III *BAYLEY-III | Selfinitiation | Performance-based | *Caregivers' fidelity of implementation *Parental self-efficacy *Parental satisfaction *Functional verbal utterances and type of utterance *Appropriate responsivity *Improved expressive and receptive language | *PRT | *Clinic room *Home | 1:1 | No instruction | Multiple baseline design across participants | + | + 2-4 week | + Setting | + IOR | + |
| **L. K. Koegel, Koegel, Hopkins, & Barners, 2010** | 3boy *DSM-IV *EOWPVT *ROWPVT *Geselle | Where? Question-asking | *Observation *View of the family *Performance-based | *The number of Where? Questions asked *The number of prepositions/ordinal markers the child correctly produced | *PRT | Clinic room | 1:1 | Clinician | Multiple baseline design across participants | + | - | + *Setting *Material | + IOR | - |
| **R. L. Koegel, Shirotava, & Koegel, 2009** | 3boy *DSM-IV *VABS *CDI-WS *ADOS-G | *Acquisition of Expressive verbal communication | Performance-based | *The percentage of correct verbalizations following a verbal model or independently produced *Parent report on the number of words produced | *PRT | *Home *Clinic room | 1:1 | *Clinician *Parent | Multiple baseline design across participants | + | - | - | + IF IOR | - |

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| Reference | Participant | Social Skills | Reasons for selection of social skills | Dependant Variable | Independent Variable | Setting | Instruction Arrangement | Practitioner | Design | Regression | Follow-up | Generalization | Reliability | Social validity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Schreibman, Stahmer, Barlett, & Dufek, 2009 | 6 *DSM-IV *ADOS *ADI-R *VABS *CARS *MCDI | Selfinitiation | Performance-based | *Spontaneous vocalizations or cued vocalizations *Toy contact or avoidance | *PRT *DTT | *Clinic | Small group | *Clinician | Multiple baseline design across participants | + | - | - | + IF IOR | - |
| Harper, Symon, & Frea, 2008 | 2 boy 6 peer | *Improving social interactions *Initiating play and maintenance | *Observation *Teacher input *Individualized play goals | *The number of attempts at gaining attention of peers and the number of turn-taking interactions *Peer's attention to initiate or engage in a play activity *The number of initiations to play | *PRT | *General edu. Class *Play area | Small group | Peer | Multiple baseline design across subjects | + | - | + Setting | + IOR IF | - |
| Kuhn, Bodkin, Devlin, & Doggett, 2008 | 2 girl 5 peer *BDI | Initiating conversation | No instruction | *Interaction opportunities with peers *Response to peer's cues *Cued response *Initiating conversation with peers | *PRT | Special edu. class | Small group | Peer | Multiple baseline design across participants | + | - | - | + IOR IF | - |
| Jones, & Feeley, 2007 | 2 girl 1 boy 2 mother-father *DSM-IV *BSID-II. *PLSC-IV | Initiating joint attention | Performance-based | *Responding to others' joint attention bids *Joint attention initiations | *DTT *PRT | Home | 1:1 | Parent | Multiple probe design across behavior | + | - | + Material | + IOR IF | - |
| Vismara & Lyons, 2007 | 3boy 3 caregiver *DSM-IV *VABS | Initiating joint attention | Performance-based | *Number of joint attention initiations *Contingencies to joint attention initiations *Qualitative measures of child-caregiver interaction | *PRT | *Clinic *Home | 1:1 | *Caregiver *Researcher | ABA | + | - | - | + IF IOR | - |
| Gillett & LeBlanc, 2007 | 3 boy 3 mother *GARS *PPVT-III | *Pronunciation *Playing | Performance-based | *Frequency of vocalizations *Self vocalizations *Parent implementation of NLP | *PRT (NLP) | *play room *Home *Clinic room | 1:1 | Parent | Multiple baseline design across participants | + | - | + Setting | + IOR IF | + |
| Reference | Participant | Social Skills | Reasons for selection of social skills | Dependant Variable | Independant Variable | Setting | Instruction Arrangement | Practitioner | Design | Regression | Follow-up | Generalization | Reliability | Social validity |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Whalen, Schreibman, & Ingersoll, 2006** | 4 6 peer *BAYLEY *CDI *CARS *GARS *DSM-IV | *Initiating joint attention *Play initiation *Self-initiation | Performance-based | *Joint attention responding *Joint attention initiations *Social initiations, positive affect, empathic response | *PRT *DTT | Clinic room | No instruc-tion | Researcher | Multiple baseline design across participants | + | + 3 month | - | + IOR | - |
| **Jones, Carr, & Feeley, 2006** | 5 boy 1 mother-father 1 mother *BSID *PLC *HELPDC *REELS | *Initiating play *Selfinitiation | Performance-based | *Engage in joint attention *Joint attention initiations and maintenance *Self-initiations | *PRT *DTT | *Class-roo *Lunch room | 1:1 | *Teacher *Paraprofes-sional *Pa-rent | Multiple baseline de-sign across behavior | + | + 1.5-10 month | + *Sti-mulus *Ma-terial *Per-son *Set-ting | + IOR IF | + |
| **L. K. Koegel, Carter, Koegel, 2003** | 2 boy *DSM-IV *TELD *LIPS *PPVT-R *EOWPVT-R *S-BIS | Self-initiated query either -ed and -ing | Performance-based | *Number of occurrences of past and progressive tense *Number of production What hap-pened and What's happening? *Percent corect responses using present progressive and past tense *Diversity of verbs *Total number of occurrences of verbs *Mean length of utterance *Generalization | *PRT | *Cli-nic room *Home *Cli-nic room | 1:1 | Researcher | Multiple baseline de-sign across behavior | + | + | + *Sti-mulus *Ma-terial *Per-son *Set-ting | + IOR | - |
| **R. L. Koegel, Symon, & Koegel, 2002** | 3 girl 2 boy 3 mother-father, 1 mother, 1 mother-grand -mother *DSM-IV | Selfinitiation | *View of the family | *Parents' implementation of the PRT techniques that focused on improving motivation *Children's expressive verbal com-munication *Parent's composite affect score during parent-child interactions | *PRT | *Cli-nic room *com-munity area *Home | 1:1 | *Caregiver *Parent trainer | Multiple baseline design across participants | + | + 3,4,9,11,12 month | + *Set-ting | + IOR IF | - |
| **Koegel, O'Dell, & Koegel, 1987** | 2 *NSCAA *VSMS *Cattel *Merrill Palmer | Self-initiation | Performance-based | *Imitating utterances *Spontaneous utterances *Generalization | *PRT (NLP) *Ana-log | Clinic room | 1:1 | Clinician | Multiple baseline design across participants | + | + 1 month | + *Set-ting IOR *Per-son | + | - |
| **Laski, Charlop, & Schreibman, 1988** | 7 boy 1 girl 6 peer 6 mother *NSAC | Self-initiation | Performance-based | *Self-initiations during play *Parent's conversation in play *Decrease in the frequency of echolalia | *PRT (NLP) | *Clinic room *Home | 1:1 | Caregiver | Multiple baseline de-sign across behavior | + | + 1 week | + *Set-ting IOR *Ma-terial *Per-son | + | - |

**Table 1.**
*A Brief Analysis of Studies with Pivotal Response Teaching in Teaching Social Skills to Children with Autism*

| Reference | Participant | Social Skills | Reasons for selection of social skills | Dependant Variable | Independent Variable | Setting | Instruction Arrangement | Practitioner | Design | Regression | Follow-up | Generalization | Reliability | Social validity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Koegel, Camarata, Koegel, BenTall, & Smith,1998 | 4 boy 1girl *DSM-IV *PPVT-R *EOWPVT-R *CELF-R *ACLC *VABS *TELD *AAPS | Increasing speech intelligibility | Performance-based | *Children's correct production of the target sounds *Ratings of the children's overall intelligibility during unstructured conversational interactions | *PRT *Ana-log | *Room *Home *School | 1:1 | Clinician | ABA | + | - | + *Set-ting IF *Per-son | + *Per-son | - |
| Koegel, Camarata, Valdez Menchaca, & Koegel, 1998 | 2 boy 1girl *VABS | What? Question-asking | No instruction | *Number of times the child spontaneously used the targeted question *Number of stimulus items the child labeled correctly | *PRT | *Room *Home | 1:1 | Clinician | Multiple baseline design across participants | + | - | + *Sti-mulus *Per-son *Sti-mulus | + IOR | - |
| Pierce, Glad, & Schreibman, 1997 | 2 boy 8 peer | *Initiating play with friends *initiating conversation | To remove the limitations of previous research | *Fidelity of implementation *Initiates conversation *Initiates play *Continued environment in same verbal or nonverbal activity as peer | *PRT | *Class *Activity room | No instruction | Peer | Multiple baseline design across participants | + | + 2 month | + *Per-son IOR *Set-ting *Ma-terial | + *Set-ting *Ma-terial | - |
| Stahmer, 1995 | 7 boy 7 peer *PPVT *EOWPVT *Leither *S-BIS *DSM-IV | Playing pretend play | *Levell of readiness *Performance-based | *Symbolic Play Skills *Complexity of play behavior *Creativity of play *Initiates play *Interaction with the play partners | *PRT | *General edu. clss. *Home | Group | Researcher | Multiple baseline design across behavior | + | + 3 month | + *Per-son IOR *Set-ting *Ma-terial | + *Set-ting *Ma-terial | - |
| Thorp, Stahmer, & Schreibman, 1995 | 3 boy *PPVT-R *EOWPVT-R *S-BIS *DSM-III-R | Playing | Performance-based | *Play behaviors *Continued engagement in play *Social behaviors *Self-initiations | *PRT | *Home *Clinic | 1:1 | Researcher | Multiple baseline design across behavior | + | + | + *Per-son IOR *Set-ting *Ma-terial | + *Set-ting *Ma-terial | - |

*AAPS= Arizona Articulation Proficiency Association *ABC= Autism Behavior Checklist *ACLC= Assessment of Childrens Language Comprehension *ADI-R= Autism Diagnostic Interview- Revised *ADOS-G= Autism Diagnostic Observation Schedule-Generic *BDI=Battelle Developmental Inventory *BAS-II=British Ability Scales-II *BAYLEY-III= Bayley Scales of Infant and Toddler Developement-III *CARS: Childhood Autism Rating Scale *CELF= Clinical Evaluation of Language Fundamentals- Revised *DAS=Differential Ability Scale *DSM-IV= American Psychiatric Association Fourth Edition *EOWPVT= Expressive One Word Picture Vocabulary Test *EOWPVT-R= Expressive One Word Picture Vocabulary Test- Revised *GARS= Gilliam Autism Rating Scale *HELPDC= Hawaii Early Learning Profile Developmental Checklist *LIPS=Leiter International Performance Scale *NSCAA= National Society for Children and Adults with Autism Criteria *NSAC= National Society for Autism Criteria *MCDI=MacArthur Communicative Developmental Index *PLS AC=Preschool Language Scale-IV, Auditory Comprehension *PLS EC= Preschool Language Scale-IV, Expressive Communication *PPBS=Preschool Play Behavior Scale *PPVT-III= Peabody Picture Vocabulary Test, Third Edition *PPVT-R= Peabody Picture Vocabulary Test- Revised *RE ELS= Receptive Expressive Emergent Language Scale *RE ELS= Receptive Expressive Emergent Language Scale—2nd Editio *S-BIS=Stanford-Binet Intelligence Scale *TELD= Test of Early Language Development *VABS= Vineland Adaptive Behavior Scale *VSMS= Vineland Social Maturity Scale *WPSSI-III= Weshler Preschool and Primary Scale of Intelligence-III *PRT=Pivotal Response Treatment *DTT= Discrete Trial Training *IF= Intervention Fidelity *IOR= Interobserver Reliability

26% of the studies reported only generalization of across setting, in 18% of the studies the data were collected pertaining to generalization across people, environments and materials; in 9% people, environments, materials and stimuli, in 9% environments and materials; in 4% people, environments and stimuli; in 4% people and activities; whilst in 26% of the studies were not reported generalization data.

**Social Validity, Inter-observer Reliability and Treatment Fidelity:** Social validity data were collected in 22% of the studies in which PRT were used in the teaching of social skills to individuals with ASD. In 17% reported subjective evaluation, in 5% reported both subjective evaluation and normative comparision collected with social validity data but 78% of the studies were not reported social validity data at all. In 57% of the studies reported inter-observer reliability, in 4% only treatment fidelity, and 39% reported both inter-observer and fidelity of implementation data.

### Discussion

In this study, a review was made of studies related to the use of PRT in the teaching of social skills to children with ASD and the prominent findings were analysed in each category according to the criteria. When participants were examined in terms of gender, a larger percentage of participants in the PRT interventions were described as male (51%). Autism statistics from the U.S. Centers for Disease Control and Prevention (CDC) identify around 1 in 88 American children as on the autism spectrum disorders. Studies also show that autism is four to five times more common among boys than girls. This information is given to attention, the participants of the studies is not surprising that more and more men.

Utilization of various assessment tools in selecting subjects in treating social skills with PRT is an conspicuous finding. Generally, studies utilized at least 1 to at most 8 assessment tools. Contribution of such assessments are obvious in that; selecting the right social skill to be treated, defining the right methods and strategies appropriate for the skill and hence a successful treatment as a result of accurately defined performances of the subjects. From this point of view, in researches with a detailed inclusion assessment process, achievement in the treatment of social skills is the expected outcome.

In studies included in this research, social skills to be treated like language and communication, social and play skills which are basic developmental areas are selected with taking needs of the children with ASD into account. Considering the characteristics of the autism spectrum disorders, social skills selected are quite appropriate and functional for the subjects. Moreover, taking the idea that the studies aiming basic developmental areas are more likely to be successful (R. L. Koegel, Koegel, & McNerney, 2001), selecting basic developmental skills as a target makes more sense.

In all of the studies examined, no other reinforcers used other than natural social reinforcers to reinforce the correct responses of the subjects. The reason for not using any other reinforce is that the targeted skill in PRT itself is a natural reinforcers (Koegel & Johnson, 1989). Examining the studies with respect to the treatment environments, it is found that studies carried out in various treatment settings (clinic, geneal education classroom, special education classroom, play room, play garden, home etc.). Examination of the literature reveals that children with ASD are poor in responding to multiple-stimuli, and that they are limited-responders to stimuli around them or that they focus on unrelated details of the stimuli, in other words, they are over-selective in stimuli (Burke & Cernigeria, 1990; R. L. Koegel et al., 2001; L. K. Koegel, Koegel, Shoshan, & McNerney, 1999; Stahmer et al., 2010). Therefore, it is a basic and an important feature of the researchers working with children with ASD to teach multiple-responses to multiple-stimuli in multi-media. Another eye catching finding of this study is that more studies used structured clinical settings during the treatment of social skills. This limitation on the other hand is eliminated by the realization of across-setting generalization with the application of the treatment in various natural settings.

70% of the PRT applications appeared to be implemented with one-to-one designs. Considering that children learn social skills by observing others around them, modeling them and imitating them, it is thought that group instructions (large or small groups) would contribute to the outcomes (developing social skills and recognition of the social cues) while teaching social skills. Examining the studies with respect to the implementers of the PRT, it is an important finding that the implementers varied within studies; researchers/clinicians, parents, primary care takers, peers, master teacher etc. were the implementers of PRT. Implementation of the applications by different implementers decreased the over-selectiveness of the individuals with PRT and favored the generalizability of the skills being taught.

In 57% of the examined studies maintenance data were collected. A noticeable point regarding maintenance data is that most of the studies did not define a follow-up process or period. Most of the studies defined a maintenance period, which was seen to be between 2 weeks and 12 months. When it is considered that normally developing children start to forget after 6 weeks, even though these periods seem to be appropriate for special needs children, they can be said to be short for permanence of learning and social validity (Gul & Vuran, 2010). In 74% of the included studies, generalization processes are planned and while planning this process, required attention is paid to the process with multiple-sample studies; is implementation of the treatments either in communal areas or the conditions made similar to the conditions to be generalized and whether implemented in various settings and with various implementers or not.

Only 22% of the studies which used PRT in treatment of the social skills reported social-validity data, which is quite a low rate for the studies focusing on social skill treatment. Social validity is a very important feature because of the fact that it is an evaluation of the importance of the effects, suitability of the methods that will be applied to achieve the aims and the meaningfulness of the aims that are determined (Wolf, 1978). Social validity can be evaluated in two ways: *(i)* subjective evaluation, *(ii)* social comparison. In addition to these two approaches, if a learned skill continues when the skill is completed and the eff ects of the application keeps the permanence for a long time, it is possible to talk about social validity (Kennedy, 2005). While 95% of the studies examined determined the social validity with subjective assessment approach, only one study reported subjective assessment together with social comparison (Jones, et al., 2006). Another interesting finding related with social validity data is that although 57% of the studies monitored the effectiveness of the implementations, none of them related the maintenance of the social skills with social validity. Furthermore, another remarkable finding is; when the studies are examined with respect to collection of social validity data, it is revealed that studies reporting social validity data are the ones performed on and after 2006. With this information in hand, we can conclude that researchers are more careful in collecting social validity data in recent years. Treatment fidelity data were collected in only 4% of the studies. Both inter-observer agreement data and treatment fidelity were collected in 39% of the studies.

## Limitations and Suggestions for Future Research and Applications

Findings of this study are important in gathering the research designs on treating social skills of children with PRT in a single study. Still, the most important limitation of this study is exclusion of studies other than single-subject studies. It is observed that various standard assessment tools are used to assess subject performances across studies. In prospective studies, monitoring subjects in natural environments for their performances in primary developmental areas like communication and social behaviors could also be included together with standard tests. However, such assessment tools are more limited in Turkey. Hence, development or adaptation of such assessment tools is required. Prospective studies are advised to perform development or adaptation studies of assessment tools in this subject.

Future studies can also concentrate on the social validity data reported across studies and analyze conformity, acceptability and importance of PRT in treating social skills. Instead of limiting the time interval of the studies to be included, future researchers can perform long term examinations of transmissibility of the acquired skills to real life both from social validity and generalizability. Since the actual aim of teaching social skills to individuals with developmental disabilities is to help them establish communication and interaction with peers who have normal development and to increase their quality of life, the studies in which social validity data is collected through social comparison may be included in the scope as well. In addition, studies performed so far are mostly one-to-one studies. In order to increase the generalizability of the findings of these studies, small and large group researches can be designed in treatment of social skills with PRT.

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