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Naturalistic teaching approaches for children with autism spectrum disorder: A systematic review of single-subject experimental design graduate theses conducted in Türkiye

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ABSTRACT

Naturalistic teaching approaches constitute an important field of research that utilizes existing materials and spontaneous situations in the child's environment within the teaching process. The purpose of this study is to examine national graduate theses that employ naturalistic teaching approaches in the education of individuals with autism spectrum disorder, conducted using single-subject experimental designs, in terms of their descriptive characteristics, publication status in peer-reviewed journals, and adherence to the design standards established by the What Works Clearinghouse. The research was structured based on the systematic review method, and eighteen theses that met the predetermined inclusion and exclusion criteria were included in the study. The process of identifying the theses included in the research was reported in accordance with PRISMA guidelines. Descriptive analysis findings revealed that the most frequently used independent variables in the theses were incidental teaching and pivotal response training, and that language/communication skills and social skills were the most commonly targeted skill areas. Furthermore, except for one study, all theses included at least one maintenance session and social validity data, and generalization sessions were conducted in most of the studies. A portion of the examined theses were found to have been published in a peer-reviewed journal (n = 5, 27.8%). Findings related to design standards indicated that only four of the theses fully met the WWC (2020) standards, eight met the standards conditionally, and six did not meet the standards. The results of the study demonstrate that naturalistic teaching approaches are effective, yet methodological improvements are necessary to meet design standards. The findings were discussed within the framework of the current literature, and recommendations for future research, policies, and practices were provided.

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Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by deficits in social interaction and communication, along with repetitive behaviors, restricted interests, and stereotyped patterns (American Psychiatric Association [APA], 2022). According to data presented by the Centers for Disease Control and Prevention (CDC), the prevalence of ASD was reported as 1 in 36 children (Maenner et al., 2023), while a more recent study indicated that this rate has increased to 1 in 31 children (Shaw et al., 2025). Although this increase is concerning, it also highlights the necessity and importance of educational initiatives for individuals with ASD. The rise in ASD prevalence over the past 30 years has led to a diversification of available services. This diversification has raised questions regarding which interventions are more effective and has shaped the research agenda of institutions conducting studies in the field of ASD, such as the National Autism Center (NAC), the National Professional Development Center on Autism Spectrum Disorder (NPDC), and the National Clearinghouse on Autism Evidence and Practice (NCAEP). Consequently, evidence-based practices have been identified and listed for individuals with ASD. This list is particularly important as it assists special education stakeholders in selecting appropriate and functional interventions. One of the evidence-based practices included in the list is the naturalistic teaching approach (NAC, 2015; NPDC, 2014).

Although the terms "approach," "method," and "strategy" may seem related, they carry distinct meanings in both theoretical and practical contexts. A review of the relevant literature shows that these terms are often used interchangeably. An "approach" is the most general concept, representing the fundamental perspective toward a topic or problem, whereas a "strategy" provides a more limited framework that encompasses methods and techniques. "Method," on the other hand, refers to the ways through which selected strategies are translated into practice (Cırık, 2014; Çelik, 2019; Tharp & Gallimore, 1988). Within this framework, naturalistic teaching approaches can be considered a concept encompassing various strategies and methods that share many common characteristics but are referred to differently in the literature due to differences in their implementation (Çelik, 2019).

Naturalistic teaching approaches constitute an eclectic model that aims to support children with developmental disabilities in their natural contexts, is grounded in a developmental perspective, and incorporates behavioral principles of applied behavior analysis (Aldemir-Fırat & Ergenekon, 2018; Kaiser & Trent, 2007; Odom et al., 2012; Schreibman et al., 2015). This eclectic structure represents a planned process in which numerous teaching techniques are used by centering adult–child interaction and systematically embedding learning opportunities into daily routines, activities, and transition times (Odom, 2016; Rakap, 2017; Rule et al., 1998; Snyder et al., 2015). In other words, the naturalistic teaching approach aims to utilize the materials available in the child's natural environment and spontaneous events as opportunities for instruction (NAC, 2015). The functional use of such opportunities contributes to generalization, a critical stage for transferring acquired skills and behaviors into daily life, and offers an effective solution for supporting this process (Ingersoll, 2010; Koegel & Koegel, 2006).

Although naturalistic teaching approaches share common characteristics, the lack of terminological consistency and variations in procedural components make it challenging to identify, analyze, and summarize the empirical literature (Snyder et al., 2015). To ensure conceptual coherence, Rakap (2017) classified the most frequently encountered and commonly used naturalistic teaching

approaches under the categories of "incidental teaching, milieu teaching, transition-based teaching, activity-based intervention, and embedded instruction." On the other hand, Squires (2015), in his lecture notes, presented naturalistic teaching approaches as "naturalistic training, pivotal response teaching, incidental teaching, embedded instruction, milieu training, enhanced milieu teaching, prelinguistic milieu teaching, activity-based intervention, natural environment language training, reciprocal interaction teaching, and transactional training" (as cited in Tomris, 2019). Odom (2016) labeled naturalistic teaching approaches as "embedded instruction, pivotal response training, incidental teaching, activity-based intervention and enhanced milieu teaching."

Table 1

Naturalistic Teaching Approaches

Author / Source	Naturalistic Teaching Approaches
Rakap, 2017	Milieu Teaching, Activity-based intervention, Incidental teaching, Transition-based teaching, Embedded instruction
Squires, 2015 (As cited in Tomris, 2019)	Natural environment language training, Conversational training, Naturalistic training, Activity-based intervention, Incidental teaching, Embedded instruction, Milieu training, Enhanced milieu teaching, Prelinguistic milieu teaching, Pivotal response teaching, Transactional training
Odom, 2016	Incidental teaching, Embedded instruction, Enhanced milieu teaching, Activity-based intervention, Pivotal response training

When the national and international literature is examined, informative studies on the use of the naturalistic teaching approach/strategies can be found (Aldemir-Fırat & Ergenekon, 2018; Charlop-Christy et al., 1999; Rakap, 2017). There are also review and/or meta-analysis studies focusing on embedded instruction (Gülboy et al., 2023; Jimenez & Kamei, 2015; Rakap & Gülboy, 2024; Rakap & Parlak-Rakap, 2011), routine-based instruction (Ergin & Diken, 2019), enhanced milieu teaching (Kang et al., 2025), and pivotal response training (Bozkuş-Genç & Vuran, 2013; Bozkuş-Genç & Yücesoy-Özkan, 2016; Toper-Korkmaz & Diken, 2013; Verschuur et al., 2014). Review and meta-analysis studies under broader umbrella categories such as natural language teaching/interventions (Hepting & Goldstein, 1996; Lane et al., 2023), naturalistic teaching approaches (Snyder et al., 2015), and naturalistic developmental behavioral interventions (Tiede & Walton, 2019) appear to be more limited. This situation underscores the importance of presenting the relevant literature from a holistic perspective and providing a comprehensive overview of the field.

To enhance the scientific validity and reliability of single-subject research designs, it is frequently emphasized that studies must be conducted in accordance with specific methodological standards (Horner et al., 2005). In this regard, organizations such as the Council for Exceptional Children (CEC) and What Works Clearinghouse (WWC) have brought attention to the quality indicators for single-subject research, particularly within the field of ASD. Consequently, the necessity for conducting studies in alignment with these quality standards has emerged. Indeed, determining the extent to which studies meet these standards serves as a guiding function for future research. Within this framework, the systematic examination of studies conducted using naturalistic teaching approaches in terms of design standards is considered an important requirement. Based on these needs, the present study aims to examine national graduate theses conducted with single-subject experimental designs that employ naturalistic teaching approaches in the education of individuals with ASD. The research questions developed within this scope are presented in the following section.

1. What are the descriptive characteristics of national graduate theses conducted with single-

subject experimental research designs that employ naturalistic teaching approaches in the education of individuals with ASD?

2. What are the findings regarding the publication of national graduate theses conducted with single-subject experimental research designs that employ naturalistic teaching approaches in the education of individuals with ASD in peer-reviewed journals?

3. To what extent do national graduate theses conducted with single-subject experimental research designs that employ naturalistic teaching approaches in the education of individuals with ASD meet the methodological quality indicators of the WWC Standards (WWC, 2020)?

Method

This study was structured based on the systematic review method. Systematic reviews are conducted to answer a specific research question in accordance with a predefined protocol. A systematic review involves conducting a comprehensive search on the topic under investigation, identifying studies to be included according to inclusion and exclusion criteria, and synthesizing these studies (Higgins & Green, 2011; Zawacki-Richter et al., 2020). In this process, presenting reliability data and designing the methodology in an objective, traceable, and reproducible manner is essential to prevent bias (Higgins & Green, 2011). In the present study, the PRISMA guidelines, developed by Moher et al. (2009) and updated by Page et al. (2021), which provide standards for reporting systematic reviews and meta-analyses, were adopted. The research process was carried out according to the following steps: (a) conducting a comprehensive literature search, (b) evaluating the retrieved studies based on predetermined inclusion and exclusion criteria, (c) performing a descriptive analysis of the eligible studies, (d) examining the analyzed studies in terms of methodological quality according to the design standards for single-case research provided by WWC (2020), and (e) conducting reliability analyses of the obtained findings.

Literature Review

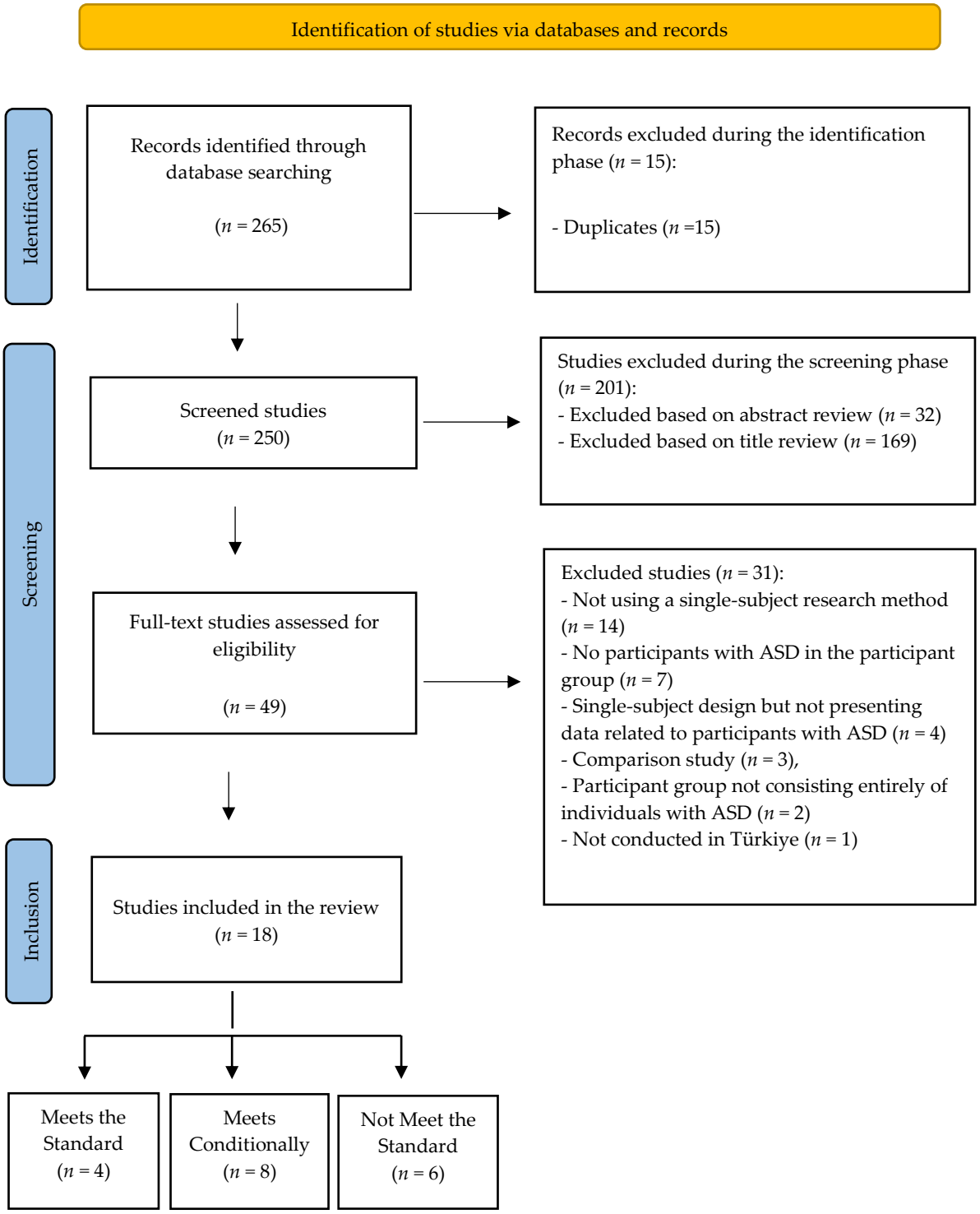
This study presents a systematic review of master's and doctoral theses in the national database that focus on the use of naturalistic teaching approaches in the educational processes of individuals with ASD. The literature search was conducted in the YÖKTEZ database between March 31, 2024, and April 29, 2024. In determining the keywords, the frameworks presented by Odom (2016), Rakap (2017), and Squires (2015), as well as the fundamental concepts of naturalistic teaching, served as the basis. Accordingly, the search was conducted without any topic limitations using the following keywords: “doğal öğretim,” “gömülü öğretim,” “milieu teaching,” “doğal bağlam,” “fırsat öğretimi,” “etkileşim temelli,” “tepki isteme,” “oyun becerileri,” “sosyal etkileşim becerileri,” “ETEÇOM,” “ebeveyn çocuk etkileşimi,” “temel tepki öğretimi,” “geçiş temelli,” “etkinlik temelli öğretim,” “rutin temelli,” and “çevresel dil.”

As a result of the search, 265 studies were identified (n = 265). First, 15 duplicate studies were excluded. Then, the titles and abstracts of the remaining 250 studies were examined. Based on the titles, 169 studies were excluded, and 32 additional studies were excluded from the abstracts for not aligning with the purpose of the present research. When the full texts of the remaining 49 studies were reviewed according to the inclusion and exclusion criteria, 14 studies that were not designed with a single-subject research method, seven studies that did not include participants with ASD, two studies in which the entire participant group did not consist of individuals with ASD, four studies

that used a single-subject research method but did not present data related to participants with ASD, three comparison studies, and one study conducted outside of the country were excluded. As a result, 18 studies that met the inclusion criteria were included in the review. All these processes, along with numerical data, are presented in the PRISMA Flow Diagram (Page et al., 2021) in Figure 1.

Figure 1

Flow Diagram for Identifying Studies Included in the Review



Inclusion–Exclusion Criteria

A set of criteria was established to determine the studies to be included in the scope of this research. Accordingly, the inclusion criteria were: (a) all participants in the study being individuals with ASD, (b) the study being conducted using one of the single-subject experimental effectiveness research designs, (c) the study having been carried out in Türkiye, (d) the dependent variable of the study involving at least one naturalistic teaching approach, (e) the study being accessible via YÖKTEZ, (f) the study presenting data in graphical or tabular form to allow the application of WWC design standards, and (g) the study providing data related to individuals with ASD.

Studies excluded from the scope of the research consisted of those that did not meet the predetermined inclusion criteria. Accordingly, the exclusion criteria were as follows: (a) studies whose participants were groups other than individuals with ASD, (b) group experimental or descriptive studies conducted outside single-subject experimental effectiveness designs, (c) studies not conducted in Türkiye, (d) studies whose dependent variables were not related to naturalistic teaching approaches, (e) theses not accessible through YÖKTEZ, (f) studies that did not present data in tables or graphs, thereby preventing the application of WWC design standards, (g) Studies using comparison designs within single-subject research designs and (h) studies that used samples other than individuals with ASD or did not separately report findings related to individuals with ASD in mixed samples.

Descriptive Analysis

The 18 studies that met the inclusion criteria were analyzed in terms of their descriptive characteristics. The studies were examined with respect to the following variables: (a) author, (b) type of publication, publication status as an article, and publication venue, (c) participant age and gender, (d) implementer, (e) setting, (f) research design, (g) independent variable, (h) dependent variable, (ı) treatment integrity, (i) interobserver agreement, (j) acquisition, (k) generalization, (l) maintenance, and (m) social validity. The results of this analysis are presented in Table 2.

Reliability

In this study, inter-coder reliability data were collected at each stage, including (a) the literature review, (b) the descriptive analysis, and (c) the evaluation of design standards. To calculate the inter-coder reliability coefficient for these stages, the formula proposed by Miles and Huberman (1994) [(Agreement / Agreement + Disagreement) × 100] was used.

Inter-coder reliability was first calculated during the "literature review" stage. To establish coding reliability, 35% of the identified studies were selected through random sampling and re-evaluated by an independent coder in accordance with the "Pre-Screening Protocol." The coder who collected the reliability data for the literature review is a doctoral student who has taken a course on systematic review and meta-analysis. Prior to initiating the coding process, the researcher informed the coder about the purpose of the study, the screening procedure, the pre-screening protocol, and data analysis. A coding table prepared by the researcher via Google Forms was used for the coding procedures. The researcher and the coder independently coded the included studies in accordance with this table. Once the forms were completed, they were transferred to Excel format and compared for accuracy. Accordingly, the coding reliability for the first stage was found to be 100%.

In the second stage, reliability data were collected for the "descriptive analysis." Thirty-five percent

(n = 6) of the studies included in the descriptive analysis (n = 18) were selected through random sampling. The coding reliability for the descriptive data of the selected studies was assessed by a faculty member who had taken a course on single-case research methods. Reliability data were obtained for all headings included in the table related to the descriptive analysis data. At this stage, coding reliability was found to be 93.3%.

Finally, reliability data were collected for the "evaluation in terms of design standards" stage. At this stage, 35% (n = 6) of the studies (n = 18) were randomly selected and independently evaluated by the same coder who participated in the descriptive analysis process, in accordance with the WWC (2020) design standards. The results were recorded in the reliability table. The coding reliability for this stage was found to be 91.6%.

What Works Clearinghouse (WWC, 2020) Design Standards

The 18 studies included in the descriptive analysis were evaluated according to the design standards developed by the WWC (2020), and the results are presented in Table 3. WWC (2020) established two types of criteria for single-case experimental research: standards and additional criteria to the standards. The standards include the following elements: (a) researcher-implemented manipulation regarding when, how, and how frequently the independent variable is applied, (b) collection of interobserver agreement data for at least 20% of each phase, with reliability coefficients of at least 80%, (c) demonstration of the experimental effect on three different occasions, and (d) inclusion of at least five data points in each phase.

Accordingly, for a study to meet the design standards unconditionally, the independent variable must be applied to all participants in the same manner, each phase must contain at least five data points, the experimental effect must be demonstrated on three different occasions (prediction, verification, and replication stages), and interobserver agreement data collected from at least 20% of all participants in all sessions must be at or above 80%. In addition, in a multiple-probe design, supplementary criteria must be met in addition to the fundamental standards. If any of the supplementary standards are not met, the study is considered not to have met the standards. The supplementary criteria specified by WWC (2020) are: (a) Baseline sessions must overlap vertically. At the "Meets Standards Without Reservations" level, three consecutive data points must be present in the first three sessions for each participant/behavior; at the "Meets Standards With Reservations" level, at least one data point must be present in the first three sessions. (b) Data points must be present immediately before the independent variable is implemented. At the "Meets Standards Without Reservations" level, three consecutive probe points must be present in the last three sessions prior to implementation for each participant/behavior; at the "Meets Standards With Reservations" level, at least one probe point must be present immediately before implementation. (c) Each participant who has not yet entered the intervention session must have a probe point in a session in which another participant first enters the intervention session or reaches a predetermined criterion.

Table 2

Descriptive Characteristics of the Studies

Author	Type/ Publication/ Publication Venue	Age and Gender	Implementer	Dependent Variable	Independent Variable	Setting
Virdil, 2023	MT - Biruni University	8 / M 8 / M 8 / M	Researcher	Emotion Recognition	Embedded Instruction with Simultaneous Prompting	CC
Yılmaz, 2023	MT - Biruni University	6 /- 6 /-	Mother	Joint Attention and Use of Gestures	Milieu Teaching	Home
Akdağ, 2022	MT - Ankara University	11-12 /- 11-12 /- 11-12 /-	Researcher	Social Skill (3 / Requesting Help, 3 / Expressing Thanks)	Pivotal Response Teaching	RC
Akgün-Giray, 2022	PhD Diss. - Anadolu University	3:7 / M 4:0 / M 3:4 / M 2:2 / F	Researcher	Pretend Play	Pretend Play Intervention Package Delivered in a Natural Context	Home
Gobadze, 2022	MT - Anadolu University	10:8 / M 12:4 / M 12:8 / M	Researcher	Social Skill (1 / Requesting Permission, 1 / Requesting Help 1 / Expressing Thanks)	Incidental Teaching	1 / Home 2 / School
Duran, 2021	MT - Bolu Abant İzzet Baysal University	8 / M 10 / M 11 / M	Researcher	Symbolic Play	Pivotal Response Teaching	School
Bilmez, 2020	PhD Diss. - Anadolu University	5:4 / M 4:8 / M 4:6 / M	Mother	Communication Skill (Saying "Open this")	Incidental Teaching	Home
İnce, 2019	MT - Marmara University	5:9 / M 4:10 / M 4:9 / M	Researcher	Requesting Help	Incidental Teaching	IDS
Okatan, 2019	MT - Gazi University	8:1 / M 8:2 / F 7:5 / M	Researcher	Social Skill (3 / Greeting 3 / Sharing	Incidental Teaching	School

				3 / Inviting to Play)		
Çattık, 2019	PhD Diss. - Anadolu University	5:6 / M 4:8 / F 5:7 / F 5:1 / M	Mother Father	Social Skill (4 / Requesting Help, 4 / Expressing Thanks, 4 / Requesting an Object)	Mand-Model Procedure	IDS
Yıldırım, 2019	MT - Biruni University	5:10 / M 4:2 / M 3:6 / M	Researcher	Expressive Language Skills (4 / 4W1H)	Classroom-Based Pivotal Response Teaching	EPCC
Bozkuş-Genç 2017	PhD Diss. + Anadolu University	4:4 / M 3:7 / M 3:9 / M 4:5 / M	Researcher	Communication Skills (Initiating Communication 4 / What is this? 4 / Where? 4 / Who is this? 4 / What happened? 4 / Whose is this?)	Pivotal Response Teaching	SERDP Unit
Demirtaş, 2017	MT + Gazi University	3:0 / M 2:10 / M 2:11 / M	Researcher	Expressive Language Skills (Intentional Verbal Communication Skills)	Pivotal Response Teaching	LDERC
Cebeci, 2015	PhD Diss. - Bolu Abant İzzet Baysal University	5:2 / M 4:3 / F 4:8 / M	Assistant Staff	Communication Skills (1 / take, give, open, 1 / pull, come, hold, 1 / remove, drop, bring)	Incidental Teaching	RC
Gürel-Selimoğlu, 2015	PhD Diss. + Gazi University	6:0 / M 4:0 / M 3:2 / F	Mother	Social Interaction	ETEÇOM	LDERC / RC
Toprak, 2015	MT - Marmara University	3:3 / F 4:2 / F 3:10 / M	Researcher	Expressive Language Skills (word	Enhanced Milieu Teaching	School

				and syllable count)		
Eren, 2012	PhD Diss. + Marmara University	4:5 / M 5:5 / M 3:0 / F	Researcher	Concept Teaching (Yellow concept)	Embedded Instruction with Least-to-Most Prompting	RC
Mısır-Horasan, 2011	MT + Marmara University	5:9 / M 5:3 / M 5:6 / M	Educator	Requesting Lost Objects ('where …?')	Incidental Teaching	School

Note. MT = Master's Thesis; PhD Diss. = PhD Dissertation; M = Male; F = Female; RC = Rehabilitation Center; IDS = Institute for Disability Studies; EPCC = Education and Psychological Counseling Center. SERDP Unit = Special Education Research, Development and Practice Unit; CC = Counseling Center; LDERC = Learning Development Education and Research Center; ETEÇOM = Interaction-Based Early Childhood Intervention Model.

Table 2 (continued)

Descriptive Characteristics of the Studies

Author	Research Design	IOA	TI	Acquisition	Maintenance	Generalization	Social Validity
Virdil, 2023	MPPSP	%30 %100	%30 %100	3/3	1, 2, 3 weeks	Environment Material	Parent / Questionnaire
Yılmaz, 2023	MPTBB	- -	%20-%30 %100	Joint Attention 2/1 Use of Gestures 2/2	1, 3 weeks (10 and 20 days)	-	-
Akdağ, 2022	MPTBP	%30 %80-%100	%33 %82-%100	Requesting Help 3/3 Expressing Thanks 3/1	2 weeks	-	Parent / Interview
Akgün-Giray, 2022	MPPSP	%30 %100	%30 %93.3-100	4/4	1, 3, 5 weeks	Environment Material	Parent / Interview SC
Gobadze, 2022	MPPSP	%30 %99-100	- %98-100	3/3	1, 2, 4 weeks	Person Environment	Parent Classroom Teacher Participant/ Questionnaire
Duran, 2021	MPPSP	%30 %98-%100	%30 %94-%97	3/3	-	Environment	Parent/ Questionnaire
Bilmez, 2020	MPTBD	%30 %100	%30 %100	3/3	1, 3, 5 weeks	Environment Routine Person	Parent/ Questionnaire
İnce, 2019	MPPSP	%30 %85,7 - %100	%30 %96,9-97.1	3/3	3, 5, 7 weeks	Environment Material Person	Parent/ Questionnaire

Okatan, 2019	MPTBP	%30 %94-%100	%30 %100	3/3	1, 2, 4 weeks	Person Environment	Parent Support Education Teacher/ Questionnaire
Çattık, 2019	MPPSB	%30 %80-%100	%30 %85,7-%100	4/4	2, 4, 6 weeks	Person Environment	Parent/ Pre- and Post-Study Interview SC
Yıldırım, 2019	MPPSP	%30 %89-%95	-	3/3	2, 3 weeks	Person Environment	Parent/ Questionnaire
Bozkuş-Genç 2017	MBP	%30 %98,1 - %100	%30 %97,1-%100	4/4	7–10 sessions (Weeks 2–30)	Environment Material Person	Parent/ Interview
Demirtaş, 2017	MBP	%33 %92-%100	%33 %86-%100	3/3	3 weeks	Person Environment	Parent/ Interview
Cebeci, 2015	MPTBB	%20 %95-%100	- %92 – %100	3/3	1, 2, 4 weeks	Environment Material Person	Parent Teacher/ Interview
Gürel-Selimoğlu, 2015	MBP	%30 %81-%92	%30 %100	3/3	8 weeks	-	Parent/ Interview
Toprak, 2015	MPPSP	%30 %83-%100	- %88 – %100	3/3	2, 4 weeks	Environment Material Person	Parent Teacher/ Questionnaire
Eren, 2012	MPTBP	%20 %100	%20 %96,8-%100	3/3	1, 2, 4 weeks	Environment Material Person	Parent/ Questionnaire
Mısır-Horasan, 2011	MPPSP	%30 %96-%100	- %100	3/3	1, 3, 6 weeks	Environment Material Person	Parent Teacher/ Questionnaire

Note. IOA = Interobserver Agreement; TI = Treatment Integrity; MPPSP = Multiple Probe Across Participants with Probe Sessions Model; MPTBB = Multiple Probe Across Behaviors with Trial-Based Probes Model; MPPSB = Multiple Probe Across Behaviors with Probe Sessions Model; MPTBP = Multiple Probe Across Participants with Trial-Based Probes Model; MPTBD = Multiple Probe Across Dyads with Trial-Based Probes Model; MBP = Multiple Baseline Across Participants Model; SC = Social Comparison.

Findings

Descriptive Analysis Findings

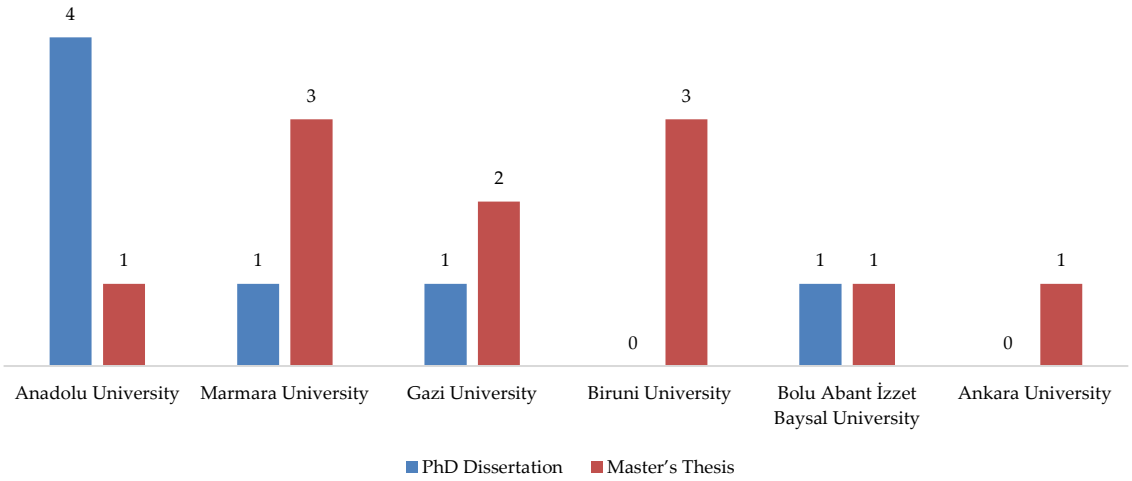
In this section, descriptive findings related to the master's theses (n = 11) and doctoral dissertations (n = 7) that met the inclusion criteria are presented. The descriptive findings are presented under three headings: (a) Findings Related to the Bibliographic Information of the Theses, (b) Findings Regarding Methodological Characteristics, and (c) Findings Regarding the Publication Status of the Theses.

Findings Related to Bibliographic Information

A total of 18 theses were included in the systematic review. Of these theses, 61.1% were master's theses (n = 11) and 38.9% were doctoral dissertations (n = 7). It was determined that theses were conducted at six different universities. The highest number of theses was carried out at Anadolu University (n = 5, 27.7%). This was followed by Marmara University (n = 4, 22.3%), Gazi University (n = 3, 16.7%), Biruni University (n = 3, 16.7%), Bolu Abant İzzet Baysal University (n = 2, 11.1%), and Ankara University (n = 1, 5.5%). The distribution of these by type across universities is shown in Figure 2.

Figure 2

Distribution of the Studies by University and Thesis Type



Findings Regarding Methodological Characteristics

In this section, the findings are presented under the headings of participants' age and gender characteristics, setting and implementer, research design, dependent and independent variables, interobserver agreement and treatment integrity, acquisition, generalization and maintenance, and social validity.

Participants' age and gender characteristics: A total of 56 students were included in the theses examined. The ages of the participants ranged from 2 years 2 months to 12 years 8 months. Forty-two of the participants were male (n = 42, 75%), and nine were female (n = 9, 16.1%). In the studies conducted by Akdağ (2022) and Yılmaz (2023), no clear information regarding the participants' gender was reported (n = 5, 8.9%). When evaluated in terms of age levels, it was determined that in 15 of the 18 thesis studies (n = 15, 83.3%), the students were in the early childhood stage. In three studies (n = 3, 16.7%), the participants were in older age groups (Akdağ, 2022; Duran, 2021; Gobadze, 2022).

Implementer: It was determined that in the majority of the 18 reviewed studies, the interventions were conducted by the researcher (n = 12, 66.6%). In three studies, it was observed that the interventions were carried out by mothers (n = 3, 16.6%) (Bilmez, 2020; Gürel-Selimoğlu, 2015; Yılmaz, 2023). In addition, in one study, both mothers and fathers took part in the intervention process (n = 1, 5.6%) (Çattık, 2019), in one study the intervention process was conducted by auxiliary staff (n = 1, 5.6%) (Cebeci, 2015), and in another study the intervention was implemented by an educator (n = 1, 5.6%) (Mısır-Horasan, 2011).

Setting: When examining the environments in which the theses were conducted, five thesis studies were carried out in school settings (*n* = 5, 25%) (Duran, 2021; Gobadze, 2022; Mısır-Horasan, 2011; Okatan, 2019; Toprak, 2015). Five thesis studies were conducted in university-affiliated centers (*n* = 5, 25%) (Bozkuş-Genç, 2017; Çattık, 2019; Demirtaş, 2017; Gürel-Selimoğlu, 2015; İnce, 2019). The implementation setting of four studies was rehabilitation centers (*n* = 4, 20%) (Akdağ, 2022; Cebeci, 2015; Eren, 2012; Gürel-Selimoğlu, 2015). Four studies were conducted in home environments (*n* = 4, 20%) (Akgün-Giray, 2022; Bilmez, 2020; Gobadze, 2022; Yılmaz, 2023). Counseling centers were preferred as the implementation setting in two theses (*n* = 2, 10%) (Virdil, 2023; Yıldırım, 2019). In two studies, it was stated that two different settings were involved during the implementation phase (Gobadze, 2022; Gürel-Selimoğlu, 2015).

Independent Variable: It was observed that the most frequently used independent variable in the theses was incidental teaching (*n* = 6, 33.3%). Pivotal response teaching was included in five studies (*n* = 5, 27.8%). Embedded instruction (*n* = 2, 11.1%) and Milieu Teaching / Enhanced Milieu Teaching (*n* = 2, 11.1%) were used in two theses. The Mand Model was applied in only one study (*n* = 1, 5.6%). In addition, in two studies, package intervention programs incorporating naturalistic teaching approaches were used as the independent variable (*n* = 2, 11.1%) (Akgün-Giray, 2022; Gürel-Selimoğlu, 2015).

Dependent Variable: It is observed that the most frequently used dependent variables in the reviewed theses are communication skills and social skills (*n* = 13, 72.2%) (Akdağ, 2022; Bilmez, 2020; Bozkuş-Genç, 2017; Cebeci, 2015; Çattık, 2019; Demirtaş, 2017; Gobadze, 2022; Gürel-Selimoğlu, 2015; İnce, 2019; Mısır-Horasan, 2011; Okatan, 2019; Toprak, 2015; Yıldırım, 2019). Play skills were included as the dependent variable in two theses (*n* = 2, 11%) (Akgün-Giray, 2022; Duran, 2021). Each of the other dependent variables appeared in a single study: emotion recognition (*n* = 1, 5.6%) (Virdil, 2023), concept teaching (*n* = 1, 5.6%) (Eren, 2012), and joint attention and gesture use (*n* = 1, 5.6%) (Yılmaz, 2023).

Research Design: The most frequently preferred design in the studies was the multiple probe design with probe sessions across participants (*n* = 8, 44.2%). The multiple probe design with probe trials across participants was used in three studies (*n* = 3, 16.7%). The multiple baseline design across participants was also preferred in three studies (*n* = 3, 16.7%). In two studies, the multiple probe design with probe trials across behaviors was preferred (*n* = 2, 11.1%) (Cebeci, 2015; Yılmaz, 2023), while in one study, the multiple probe design with probe sessions across behaviors was used (*n* = 1, 5.6%) (Çattık, 2019). In one study, the multiple probe design with probe trials across dyads was employed (*n* = 1, 5.6%) (Bilmez, 2020).

Interobserver Reliability: In the vast majority of the theses (*n* = 17, 94.4%), interobserver reliability (IOR) data were collected in at least 20% of all sessions (regardless of whether they were collected across all participants and phases) (range = 20%–33%). It was determined that the reported reliability coefficients in these studies ranged between 80% and 100%. In one thesis conducted by Yılmaz (2023) (*n* = 1, 5.6%), no information regarding IOA data was provided.

Treatment Integrity: In the majority of the reviewed theses (*n* = 13, 72.2%), treatment integrity (TI) data were collected in at least 20% of the sessions (range = 20%–33%). The reliability coefficients reported in these studies ranged from 82% to 100%. In four theses (*n* = 4, 22.2%), information regarding the proportion of sessions in which TI data were collected was not provided, although treatment integrity percentages were reported (Cebeci, 2015; Gobadze, 2022; Mısır-Horasan, 2011;

Toprak, 2015). In the thesis prepared by Yıldırım (2019) (*n* = 1, 5.6%), no information regarding TI data was reported.

Acquisition, Maintenance, and Generalization: Data regarding the acquisition of various skills/concepts were obtained from 56 participants across a total of 18 studies. It was reported that naturalistic teaching approaches were effective in all taught skills/concepts for 53 of these children (*n* = 53, 94.6%). For three children (*n* = 3, 5.4%), acquisition was achieved for one of the taught skills; however, no effective results were obtained for the other two. There are two studies in which the naturalistic teaching approach used for all participants was not reported to be effective (Akdağ, 2022; Yılmaz, 2023). Akdağ (2022) focused on teaching the skills of requesting assistance and expressing gratitude. In this study, all three participants acquired the requesting assistance skill, whereas only one participant acquired the gratitude skill. In Yılmaz's (2023) study, it was stated that "it was perceived to be effective" for gesture teaching in both participants. However, the expected level of performance in joint attention was not achieved in one participant due to behavioral problems. During the descriptive analysis process, the data from the studies were presented as reported, without adding any interpretation, as recommended by Higgins and Green (2011). However, upon examining the study graphs, it is observed that the teaching sessions were terminated without achieving stable data.

In the vast majority of the theses (*n* = 17, 94.4%), at least one maintenance session was included, and only one study (*n* = 1, 5.6%) (Duran, 2021) did not report maintenance data. In most studies (*n* = 10, 55.6%), three maintenance sessions were conducted, collected over a period ranging from one to seven weeks. In three studies (*n* = 3, 16.6%), two maintenance data points were collected within a range of 1–4 weeks (Toprak, 2015; Yıldırım, 2019; Yılmaz, 2023). In another three studies (*n* = 3, 16.6%), only one maintenance data point was reported, with sessions conducted between 2 and 8 weeks (Akdağ, 2022; Demirtaş, 2017; Gürel-Selimoğlu, 2015). In one study (*n* = 1, 5.6%), in addition to proximal maintenance data collected biweekly, long-term maintenance data were also obtained, ranging between 16 and 30 weeks (Bozkuş-Genç, 2017).

When the generalization data are examined, it is observed that the majority of the theses (*n* = 15, 83.4%) included generalization sessions. In three theses (*n* = 3, 16.6%), no generalization sessions were conducted (Akdağ, 2022; Gürel-Selimoğlu, 2015; Yılmaz, 2023). Among the studies in which generalization sessions were conducted, six applied setting, person, and material generalization together (*n* = 6, 40%) (Bozkuş-Genç, 2017; Cebeci, 2015; Eren, 2012; İnce, 2019; Mısır-Horasan, 2011; Toprak, 2015). In five studies, setting and person generalization were implemented (*n* = 5, 33.3%) (Çattık, 2019; Demirtaş, 2017; Gobadze, 2022; Okatan, 2019; Yıldırım, 2019). In two studies, setting and material generalization were used (*n* = 2, 13.3%) (Akgün-Giray, 2022; Virdil, 2023); in one study, person, setting, and routine generalization were applied (*n* = 1, 6.7%) (Bilmez, 2020); and in one study, generalization across settings was implemented (*n* = 1, 6.7%) (Duran, 2021).

Social Validity: It was determined that social validity data were collected in nearly all theses (*n* = 17, 94.4%). Only one study (*n* = 1, 5.6%) did not include such data (Yılmaz, 2023). Social validity data were obtained through questionnaires or semi-structured interviews. In two studies, in addition to semi-structured interviews, social comparison data were also presented (*n* = 2, 11.1%) (Akgün-Giray, 2022; Çattık, 2019). When the groups from which social validity data were collected are examined, it is seen that data were gathered from parents in twelve studies (*n* = 12, 70.6%) (Akdağ, 2022; Akgün-Giray, 2022; Bilmez, 2020; Bozkuş-Genç, 2017; Çattık, 2019; Demirtaş, 2017; Duran, 2021; Eren, 2012; Gürel-Selimoğlu, 2015; İnce, 2019; Virdil, 2023; Yıldırım, 2019), and from parents and teachers in five

studies (*n* = 5, 29.4%) (Cebeci, 2015; Gobadze, 2022; Mısır-Horasan, 2011; Okatan, 2019; Toprak, 2015).

Findings Regarding the Publication Status of the Theses

It is observed that a portion of the evaluated theses has been transformed into academic publications (*n* = 5, 27.8%). The master's theses were published in the *International Journal of Early Childhood Special Education* (Mısır-Horasan & Birkan, 2015) and the *Hacettepe University Journal of Education* (Demirtaş & Aykut, 2021). The doctoral dissertations were published in *Educational Sciences: Theory and Practice* (Eren et al., 2013), *Journal of Autism and Developmental Disorders* (Bozkuş-Genç & Yücesoy-Özkan, 2021), and *Journal of Early Childhood Studies* (Gürel-Selimoğlu & Özdemir, 2018).

Findings Regarding WWC Design Standards

It was determined that four of the 18 studies included in the research (*n* = 4, 22.2%) (Bilmez, 2020; Bozkuş-Genç, 2017; Çattık, 2019; Gobadze, 2022) met the design standards, eight studies (*n = 8*, 44.4%) (Akdağ, 2022; Akgün-Giray, 2022; Demirtaş, 2017; Duran, 2021; Gürel-Selimoğlu, 2015; İnce, 2019; Mısır-Horasan, 2011; Virdil, 2023) conditionally met the standards, and six studies (*n* = 6, 33.4%) (Cebeci, 2015; Eren, 2012; Okatan, 2019; Toprak, 2015; Yıldırım, 2019; Yılmaz, 2023) did not meet the design standards. The primary reason for eight studies conditionally meeting the design standards is the presence of at least three data points in each phase (to fully meet the design standards, at least five data points are required). The main reason the remaining studies failed to meet the design standards is the lack of reported interobserver reliability data collected for at least 20% of the sessions in each phase for participants/conditions. Table 3 presents the findings related to the design standards.

Table 3

Application of WWC (2020) Design Standards

Author	IV Manip.?	DV Rel. (≥20, ≥80%)	Exp. Effect (≥3 cond.)	DP ≥ 5 /phase	DP 3–4 / phase	Add. Criteria?	Design Class.	Reason
Virdil, 2023	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.
Yılmaz, 2023	Y	N	N	N	Y	N	Does Not Meet	IOA data not collected in at least 20% of each phase. Experimental effect not demonstrated across 3 different conditions. Additional criteria not met.
Akdağ, 2022	Y	Y	Y	N	Y	Y*	Meets Conditionally	Fewer than 5 data points. Additional criteria met with revision.

Akgün-Giray, 2022	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.
Gobadze, 2022	Y	Y	Y	Y	Y	Y	Meets	-
Duran, 2021	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.
Bilmez, 2020	Y	Y	Y	Y	Y	Y	Meets	-
Çattık, 2019	Y	Y	Y	Y	Y	Y	Meets	-
İnce, 2019	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.
Okatan, 2019	Y	N	Y	N	Y	Y	Does Not Meet	IOA data not collected in at least 20% of each phase.
Yıldırım, 2019	Y	N	Y	N	Y	Y	Does Not Meet	IOA data not collected in at least 20% of each phase.
Bozkuş Genç, 2017	Y	Y	Y	Y	Y	Y	Meets	-
Demirtaş, 2017	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points each phase.
Cebeci, 2015	Y	N	Y	N	Y	Y	Does Not Meet	IOA data not collected in at least 20% of each phase.
Gürel-Selimoğlu, 2015	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.
Toprak, 2015	Y	N	Y	N	Y	Y	Does Not Meet	IOA data not collected in at least 20% of each phase.
Eren, 2012	Y	N	Y	N	Y	N	Does Not Meet	IOA data not collected in at least 20% of each phase. Additional criteria not met.
Mısır-Horasan, 2011	Y	Y	Y	N	Y	Y	Meets Conditionally	Fewer than 5 data points.

Note: Y=Yes; N=No; Y*= Revision Required; IV = IV = Independent Variable; DV = Dependent Variable; Manip. = Manipulated; Rel. = Reliability; Exp. Effect = Experimental Effect; Cond. = Conditions; DP = Data Points; Add. = Additional; Class. = Classification.

Discussion, Conclusion, and Recommendations

The aim of this study is to examine graduate theses based on naturalistic teaching approaches used in the education of individuals with ASD, both descriptively and in terms of methodological quality indicators. Accordingly, 18 graduate theses that met the inclusion criteria were identified through searches conducted in the YÖKTEZ database, and the bibliographic information, methodological characteristics, and publication status of these theses were analyzed descriptively. Following the

descriptive analysis, an evaluation was conducted within the framework of the design standards for single-case research, as determined by the WWC (2020). As a result of this evaluation, it was found that four theses fully met the methodological standards, eight met the standards conditionally, and the remaining six did not meet the standards. In the subsequent phase, the findings obtained in relation to the research questions were discussed within the framework of the existing literature, and recommendations were presented.

When the findings regarding the descriptive characteristics of the studies related to the first research question are examined, it is seen that the majority of the theses (61.1%) are master's theses. This finding may be due to the fact that only effectiveness studies were included in the research. As indicated in the PRISMA diagram, this proportion would increase if comparison studies were also included. In addition, it is observed that most of theses (27.7%) were published at Anadolu University. When this finding is examined in the context of publication rates, it is consistent with the existing literature. A review of articles published in the field of special education revealed that faculty members/staff working at Anadolu University had the highest number of publications in the field (Güner-Yıldız et al., 2016). In a study conducted by Ünlü et al. (2020), based on a content analysis of 183 doctoral dissertations published between 1989 and 2017, it was found that the majority of doctoral theses (25%) were published at Anadolu University, and single-case research methods were used most frequently in these theses.

Upon examining the prominent findings regarding the methodological characteristics of the studies, it is observed that participants were in the early childhood period in almost all of the studies (n = 15; 83.3%). Parallel to our findings, a systematic review examining studies on embedded instruction reported that nearly all included studies (n = 16; 89%) were conducted with preschool-aged children (Rakap & Gülboy, 2024). Similarly, in the systematic review by Toper-Korkmaz and Diken (2013) on pivotal response teaching, the participants predominantly consisted of children aged 2–5 years in the preschool period. Additionally, the majority of the participant students were boys. According to CDC data from 2023, the prevalence of ASD in boys is reported to be 3.4 times higher than in girls (49.2 per 1,000 boys vs. 14.3 per 1,000 girls). This provides a basis for explaining the tendency for research samples to consist largely of male participants.

When the data regarding the dependent variable are examined, it is seen that communication and social skills were addressed in the majority of the studies, at a rate of 72.2%. Naturalistic teaching approaches create communication opportunities within the context of children's interests and social environments, which makes them prominent in the instruction of these skills (Kaiser & Roberts, 2013; Schreibman et al., 2015). Therefore, the predominance of communication and social skills in our study is an expected finding. In addition, it is observed that the most frequently used independent variables in the studies were incidental teaching and pivotal response teaching. While studies using incidental teaching as an independent variable show that language/communication and social skills are taught (Bilmez, 2020; İnce, 2019; Okatan, 2019; Gobadze, 2022; Cebeci, 2015; Mısır-Horasan, 2011); when studies using basic response teaching are examined, it is seen that in addition to teaching language/communication skills and social skills (Akdağ, 2022; Bozkuş-Genç, 2017; Demirtaş, 2017; Yıldırım, 2019), play skills are also included in one study (Duran, 2021).

Findings regarding treatment integrity indicate that in the majority of the theses examined (n = 13, 72.2%), treatment integrity data were collected in at least 20% of the sessions (range = 20%–33%). In Bozkuş-Genç & Yücesoy-Özkan's (2016) meta-analysis on pivotal response teaching, however, it is stated that TI data were reported in only 44% of the studies Therefore, in the context of treatment

integrity, it can be said that progress has been made in the studies. When the acquisition data are examined, it is observed that naturalistic teaching approaches were effective for all participants in the majority of the studies (n = 16, 88.9%) across various dependent variables, including communication, social, and play skills. Similar results have been obtained in review studies conducted on basic response teaching (Toper-Korkmaz and Diken, 2013) and embedded teaching (Gülboy et al., 2023; Rakap and Parlak-Rakap, 2011). Accordingly, naturalistic teaching approaches can be said to be effective in the acquisition of different dependent variables.

When follow-up and generalization data are examined, it is observed that almost all of the theses (n = 17, 94.4%) included at least one follow-up session. In addition, it was determined that the majority of the theses (n = 15, 83.3%) included generalization sessions. While Bozkuş-Genç & Yücesoy-Özkan's (2016) meta-analysis on pivotal response teaching showed that maintenance and generalization data were collected in half of the studies, the review conducted by Rakap & Parlak-Rakap (2011) on embedded instruction indicated that follow-up data were not collected in most of the studies. Therefore, it can be stated that progress has been made in collecting data related to the stages of learning.

In the context of social validity, it is observed that social validity data were collected in almost all the theses included in the present study, and the results obtained were reported positively. This indicates significant progress when compared to previous review studies. For example, Bozkuş-Genç & Vuran (2013) reported that social validity data were collected in 22% of the studies in their systematic review on pivotal response teaching, while Toper-Korkmaz & Diken (2013) reported that such data were collected in 50% of the studies in their systematic review on pivotal response teaching. Social validity is an important indicator for evaluating the extent to which an intervention is perceived as meaningful and acceptable by the target individuals or those indirectly affected by it (Atbaşı et al., 2019). Therefore, the inclusion of social validity data in nearly all of the theses examined in our study can be considered a positive development in the literature. In addition, Hanley (2010) recommends the use of multiple data collection tools and sources to ensure that social validity data are more objective and valid. In this regard, the use of both social comparison and semi-structured interview techniques in the two studies included in our research (Akgün-Giray, 2022; Çattık, 2019) is important for enriching the social validity data and presenting the effects of the study in a multidimensional manner.

In line with the second research question, an examination of the findings regarding the publication of the studies shows that 27.8% of the studies were published in various journals. At this point, it has been revealed that the rate of publishing studies as articles needs to be increased. Another noteworthy point is that the two published doctoral dissertations were published in journals with higher impact factors. This may be because doctoral dissertations generally include more in-depth analyses and provide more original contributions.

Lastly, it is an important finding that only four of the eighteen studies included in the present research (Bilmez, 2020; Bozkuş-Genç, 2017; Çattık, 2019; Gobadze, 2022) fully met the design standards in relation to the third research question. These data show that 22.2% of the theses included in the study fully met the design standards, while 44.4% met them conditionally. These findings suggest that graduate-level studies conducted in our country remain open to improvement in terms of methodological integrity and adherence to standards. Due to the requirement of collecting interobserver reliability data in at least 20% of each phase (condition/participants) and the criterion of having at least five data points, many theses did not meet the standards or met them

conditionally. It is considered that the detailed and structured criteria of the WWC (2020) standards may make it challenging to meet these standards fully. However, this is regarded as an important indicator in terms of improving research quality. Various findings regarding the fulfillment of design standards have been reported in review studies on naturalistic teaching (Lane et al., 2016; Lane et al., 2023; Rakap & Gülboy, 2024). While Lane et al. (2016) found that 37.5% of the studies they analyzed fully met the design standards, the review by Rakap & Gülboy (2024) on embedded instruction reported a rate of 22% for fully meeting the standards. In a systematic review examining single-case studies on parent-mediated naturalistic developmental behavioral interventions, it was reported that only three studies met all CEC quality indicators (Van Noorden et al., 2024). However, the CEC quality indicators (Cook et al., 2015) used in that review primarily focus on the adequacy of reporting. In contrast, the WWC (2020) standards adopted in the present study focus on methodological criteria, such as the minimum number of data points and interobserver agreement ratios. Therefore, when the literature and the present study findings are examined in relation to these standards, it appears that single-case studies based on naturalistic instruction still involve methodological limitations. This indicates the need for greater emphasis on methodological design standards and detailed reporting in future research.

Upon examining the strengths of this study, it is first noted that systematic review and meta-analysis studies have been conducted separately to address naturalistic teaching approaches. However, no study holistically examines naturalistic teaching approaches in national theses. In the present study, a holistic perspective was provided by addressing these approaches under the umbrella concept of "naturalistic teaching approaches." In this respect, the general trends, implementation practices, and research intensity within the framework of naturalistic teaching approaches were presented in an integrated manner. Moreover, the study is important in terms of enhancing the visibility of unpublished sources and demonstrating their effectiveness. Ultimately, it is believed that the study makes a significant contribution to the literature by identifying advancements and needs within the scope of the topic.

In addition to the strengths of this study, there are also certain limitations. First, the inclusion of only theses on naturalistic teaching approaches available in the YÖKTEZ database restricts the scope of the accessible literature. Second, the study included only research conducted with individuals with ASD. This limits the generalizability of the findings to other disability groups. Finally, the fact that only single-case experimental studies were examined from a methodological perspective excluded studies on naturalistic teaching approaches that employed different research methods.

Based on the findings obtained from this study, recommendations for future research, practice, and policy are presented below: (a) In future studies, it is recommended to systematically review broader databases (for example, ERIC, Scopus, Web of Science) that include peer-reviewed articles on naturalistic teaching approaches. In this way, trends in the field, research intensity, and gaps can be revealed more comprehensively. (b) In subsequent research, review or meta-analysis studies that include different disability groups and various research methods/designs (for example, mixed methods, multiple single-case comparison designs) related to naturalistic teaching approaches may be conducted. (c) Since the need to improve methodological design standards was identified within the scope of the study, integrating methodological training on single-case research methods and data recording and analysis techniques into special education undergraduate programs will contribute to enhancing the methodological quality of future studies and practices. (d) It is important that research be planned and reported in accordance with internationally recognized quality standards.

In line with these standards, it may be recommended to include courses in graduate programs that contribute to improving the quality of review and meta-analysis studies. (e) Finally, integrating these standards into national special education policies and professional competency frameworks will enhance the quality of both academic research and school-based practices.

In conclusion, in this study, theses in the national literature were examined with a holistic perspective within the framework of naturalistic teaching approaches. The findings of the research reveal that naturalistic teaching approaches were effective for all participants in the majority of the studies. When the studies were evaluated according to the WWC (2020) design standards, it was determined that only four studies fully met the methodological quality standards, while eight studies met the standards conditionally. This finding indicates the need to strengthen methodological quality standards in research conducted using single-case experimental designs.

Declarations

Ethics statement: Exemption from ethical approval was warranted as the research methodology involved the analysis of secondary data only, with no engagement of human subjects.

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