

Code 3	PE	CE	Copy edited	Figures	Tables	Suppl. mat.	Typesetting
FPL	set	oc	10.11.20	0	2		Mizpah
Language	E	Second Language		Third Language	Template_Art		ZU

Internal info: **Workpreparation Notes sind im Original Ordner gespeichert!**

Folia Phoniatica  
et Logopaedica

**KARGER**  
www.karger.com

Queries to the author

1. Please confirm that authors' names and initials have been identified correctly.
2. Please cite reference [12] in the text in order (after [11] and before [13]).
3. All authors cited in the text must have a corresponding reference in the reference list. Accordingly, please supply this reference for Kanner [49].

Article title	Developmental Profile of Social Communication: Findings in Typical Developing Greek Children
Article title second language	
Article title third language	
Subtitle	
Short title	DPSC Findings
Section title	Research Article

Relation(s) Example:	Initials S.-J.	Given name Seo-Jin	Surname/Collaboration Park	Affiliation(s) a,b
2515213	I.	Ioannis	Vogindroukas	a
2515214	E.N.	Evipridis Nikolaos	Chelas	a
2515212	N.E	Nikolaos	Petridis	b

Affiliation(s)	City	State	Country
a Institute of Research and Education of Speech Therapy (IEEL)	Ioannina		Greece
b Department of Applied Informatics, <a href="#">University of Macedonia</a>	Thessaloniki		Greece

Additional information

Corresponding author	Ioannis Vogindroukas
Full address	Institute of Research and Education of Speech Therapy (IEEL) Dagkli 1–3 GR–45444 Ioannina (Greece)
E-Mail	E-Mail Vogindroukas@ieel.gr

Citation line	Journal Folia Phoniatr Logop
---------------	---------------------------------

Translation			
10.1159/000511901	Article-Nr	511901	CCCode
ISSN	1021-7762		
ISBN			

Received	Received: December 24, 2019
Accepted	Accepted: September 24, 2020
Revised	
Published online	Published online: ■■■
Copyright statement	© 2020 S. Karger AG, Basel
Copyright description	

Keywords	Keywords
	Social communication Typical development Developmental profile of social communication (DPSC)

Keywords Second Language	
--------------------------	--

Keywords Third Language	
-------------------------	--

Abbreviations	
---------------	--

Abstract	Abstract
----------	----------

**Objectives:** The Developmental Profile of Social Communication (DPSC) is based on the communication and language development in children with social communication difficulties. DPSC facilitates understanding of the challenges these children face in social interaction, communication, and linguistic development. It utilizes clinician and parent responses to build the developmental profiles of individuals. The profile allows clinicians to determine the therapeutic goals for improved cooperation and communication in various contexts. In addition, it provides insight into the parents' perspective. The aim of this study is to present the preliminary results of the DPSC in typically developing Greek children. **Methods:** The DPSC, a 112-item questionnaire, was administered to 357 parents of typically developing children aged 2–7.5 years using a 3-scale rating of answers. It was applied electronically via Google forms, and parents were able to ask for clarification on questions. All answers were categorized and then analyzed under independent variables. **Results:** Descriptive [and hypothesis testing g](#) were used to summarize participant characteristics and performance. Findings suggest that children

---

>7.5 years tended to develop most of the rated skills of DPSC adequately. **Conclusions:** It was determined that the DPSC questionnaire is an easily administered tool that enables the evaluation of the social communication abilities of children of different ages.

---

Abstract Second Language

---

Abstract Third Language

---

Key Messages

---

---

---

Body

---

## Introduction

The increased ability to identify and/or diagnose children with developmental disorders from a very early age presents itself as both an opportunity and a challenge. Existing research has demonstrated methods for identifying children’s developmental disabilities at an even younger age, as well as methods for improving their outcomes through specific early intervention practices. These advances now allow us the opportunity to begin intervention much earlier in life [1]. Our challenge, however, is to design and adapt our means of identifying and assessing the developmental progress of younger age groups, thus achieving optimal outcomes regarding both children’s intervention and updating by parents about their children’s difficulties.

Developmental delay pertains to a child’s inability to develop and/or obtain skills, either social or cognitive, as expected according to the age of the child [2]. Efforts have been made

throughout the years to determine and establish these developmental stages in a more robust way, to be utilized as a reference both in assessing and intervening. Intelligence and language scales are mostly used to identify the appropriate deviations from typical development, while developmental assessment tools are used to form, as early as possible, a more complete and possibly definitive profile regarding developmental delays and the factors underlying these.

Major advances have been made over the past 2 decades in understanding the social-communication difficulties of children with developmental disorders and/or autism spectrum disorder (ASD), resulting in a greater emphasis on early social communication features in the diagnostic criteria [3]. It is estimated that 17% of children (up to 18 years of age) have a developmental and/or behavioural disorder [4].

To achieve early identification of developmental and/or behavioural problems (any type of deviation from the norm), the American Academy of Pediatrics [5] recommends that all infants and young children should be assessed for developmental delay, thus permitting the execution of prompt evaluation and timely intervention practices. During the evaluation process, clinicians focus on the stages and different domains of development as well. Significant domains are (in a developmental sequence) sociability, social interaction, communication, play, language, speech, and writing.

There are questionnaires and assessment instruments used to screen cognitive and developmental stages in children from birth to the age of 8 years [6, 7]. However, the current literature does not provide any robust means of potentially gathering information from different developmental domains in a comprehensive profile, from clinicians and parents. The existent difficulty in communication between parents and clinicians led specialists to create a questionnaire based on these developmental domains.

### *Sociability and Socialization*

Early stages of development are crucially linked to social abilities and intentional socialization skills within humans. Social abilities and their evaluation are connected to areas of

sociability and socialization. Sociability is the individual's ability to adapt to different social conditions and his desire to form friendly relationships, participate in joint activities, and belong to a social club or team of people with congenial interests [8]. The ability to interact with a communicative partner emerges early in human development, before language acquisition, as part of sociability. Infants' social interactions with others gradually exhibit increasing coordination of attention [9]. Early functions of sociability that have been associated with the development of language and communication skills, both in typically developing children and those with developmental difficulties, include joint attention, imitation, and toy play. Joint attention typically emerges by the age of 9 months, and by 12 months a child displays all aspects of joint attention [10, 11]. Moreover, specific theory on mind abilities suggests that joint attention skills assessed in the second year of life are closely associated with better social skills [13]. Joint attention skills are the first milestone of socialization, i.e., how an essentially biological being becomes transformed into a highly sophisticated social being [14]. Surveys have shown the importance of young children initiating joint attention as well as imitating others in developing language production. All the abilities mentioned above emerge within interactions [15]. Findings made by Toth et al. [16] indicate that children with stronger joint attention skills also present with better language abilities at 3–4 years of age. Motor imitation ability, as an aspect of socialization, has also been associated with the development of language and social communication skills. In typically developing infants, the potential to imitate is present at birth [17]. By 9 months of age, infants are able to imitate actions on objects, both in an immediate and a deferred context [18, 19], and thus learn about others' actions and intentions [20]. Imitation additionally plays an important role in early social development and is a predictive factor for language ability in typically developing children [21].

### *Social Communication*

Having developed skills concerning sociability and socialization, typically developing children use these abilities to interact with others. In the early stages of development, social

communication consists of critical early social experiences necessary for normal development. However, one would agree that basic social competencies typically acquired in the first 2–3 years of life provide an important foundation for all later social and linguistic development [22].

The identification of delays in the acquisition of interactional competencies at various points in development depends on both a model that describes how social skills develop and on an instrument for assessing those competencies [23]. A model used for social communication assessment should provide a basis for distinguishing among social skills, according to their complexity as well as their functions. Complexity should increase with development, as functioning becomes more differentiated. The results of the assessment instrument should reflect any insights provided by the model into developmental processes, functions that underlie observable interactional behaviours, and an understandable way for delivering this information.

### *Play*

Play (both functional and symbolic) is a third skill domain that has been strongly associated with language development and social communication ability. Play provides the child with opportunities for social interaction and social communication as well as a context for forming representations of intentional states and knowledge [24–26]. In typical development, functional play emerges during the first year, while symbolic play begins to emerge at around the age of one year and becomes more complex during the second year of life. Both functional and symbolic play skills have been shown to correlate with language ability in typical children [27, 28]. Symbolic play is associated with both receptive and expressive language ability, [29–31] and functional play with expressive language level in preschool age children [31]. For example, using standardized assessments of a group of children between 1 and 6 years of age, Lewis et al. [31] reported that symbolic play was correlated with both language production and comprehension. Longitudinal studies have also demonstrated a relation between early play skills and later language ability [27, 28]. More specifically, as demonstrated in the study of Ungerer and Sigman [28], functional play at 13 months corresponded with language ability at 22

months. Moreover, first-word acquisition was associated with the emergence of symbolic play according to McCune [27]. There is also some evidence that aspects of play may continue to be related to language at older ages [32]. O'Reilly et al. [32] reported 2 studies. In both studies, a correlation between language comprehension and comprehension of pretend actions was determined, with the subjects being a group of children in the second, third, and later on in the fourth year of age. Furthermore, both studies demonstrated that the ability of comprehending pretence was correlated with language comprehension, particularly O'Reilly et al. [32] concerning 5-year-old children.

### *Language*

During the middle of the 2nd year, most toddlers have accumulated a substantial expressive vocabulary. Although there is considerable variability in when they start to take this major step toward language, by 2 years of age, even relatively late talkers often demonstrate ample comprehension skills and produce dozens of different words [33]. The lack of first words is often the first developmental concern noted by parents [34], and is also the most common focus of applied intervention before any developmental disorder is diagnosed [35]. The impact of joint attention skill deficits on early word-learning is an excellent example of such a negative developmental cascade. According to social interactionist theories of early word-learning [36], joint attention skills allow a toddler to engage with caregivers, who introduce them to language during interactions that are well-suited to their current interests and communication level. Typically, these skills are mastered by the beginning of the 2nd year [9, 37] so that they can be deployed as word-learning begins. There is now strong empirical support for this developmental scenario. Most notably, there is a vast literature on joint attention skills and language outcome [38], indicating that being able to respond to a partner's input is robustly associated with language outcome in children with developmental disorders. More specifically, the skill of responding to joint attention bids as measured on standardized assessments, such as the Early Social Communication Scales (ESCS) [39], correlates significantly with both concurrent and

subsequent measures of the acquisition of words. Adamson et al. [40] indicated that the association between joint attention (the sociability aspect) at 24 months and later expressive vocabulary was relatively weak in typically developing toddlers, but a dynamic relation between joint engagement and language use was highlighted.

### *Speech*

A major early childhood milestone is attaining intelligible speech. Speech accuracy gradually improves with age and is marked by an increase in correctly used speech sounds and a decrease in systematic error patterns [41]. There is no single, universally agreed-upon speech production model regarding phonemic and phonological development. Two distinct models have been proposed and referred to as the serial processing and parallel processing models, respectively [42–44]. In the past decade, there has been a shift towards exploring the development of spoken language through the wider lens of general cognitive development [45]. Researchers have suggested that higher-level cognitive processes during development, including executive functions [46] and phonological memory [47], may underpin or perhaps interface with the speech-processing chain. Numerous researchers propose that a key cognitive system is highly likely to be involved in the process of speech acquisition. Pierce et al. [48] assert that the working memory system is designed to support language learning (including phonological), because the key processes of the working memory system, i.e., analyzing, storing, detecting, and utilizing phonological patterns, are a perfect match with the fundamental requirements of learning speech and language. It is worth noting that Pierce et al. [48] also assert that early language experiences could influence phonological working memory processes. The fact that children and adults on the autism spectrum do not orient to speech from an early age appears to support the view that the communication impairment in autism may be secondary to a broader deficit in social reciprocity and motivation. Regardless of the constantly evolving definition of autism since that determined by Kanner [49], language impairment remains a striking feature of ASD. As such, there is a critical need for effective

speech and language intervention because acquiring even a few words is the single most important predictor of positive outcomes, such as symptom reduction and increased socialization [50].

### *Writing*

Speech, reading, and writing are substantial domains to examine for the purpose of forming a profile of intellectual development. Taking into consideration evidence referring to the benefits of inclusion, more results have led to increasing numbers of children with developmental disorders participating in typical education processes [51, 52]. Several studies have indicated the significant risk for reading comprehension problems [53, 54], but these problems might actually reflect a learning disability associated with the social, cognitive, and communication difficulties that are evident in ASD as well as in children with developmental disabilities [55, 56].

Writing is a core component of the school curriculum that draws on complex social and cognitive processes and requires an array of skills and knowledge [57]. Recent research has emphasized the need for using socio-cognitive writing model frameworks for understanding writing development in clinical populations. Models aiming to understand the cognitive and social processes associated with writing have existed and continued to evolve over the last few decades. Specifically, Hayes [58] cited evidence concerning an updated writing model that focuses on 3 cognitive levels. These levels mostly refer to a hierarchy of cognitive and social processes involved in writing expression. These 3 cognitive levels stand for control, process, and resource level. The control level contains task initiation, planning, goal-setting, and background knowledge processes to contextualize different writing tasks. The process level includes 4 task environment factors that highlight social and physical writing processes. The resource level incorporates general cognitive processes that influence writing including attention, long-term memory, working memory, and reading.

The aim of this study was to present the preliminary results of the functionality of the Developmental Profile of Social Communication (DPSC) in typically developing Greek children aged 2–7.5 years. The DPSC was created by I.V. and E.N.C., using questions concerning all the developmental areas mentioned. Specifically, the developmental areas discussed here include sociability, socialization, communication, play, language, speech, and writing. The questions represent specific stages or abilities in these areas, in a developmental order, and ought to be answered in a collaborative way by clinicians and parents. The DPSC questionnaire is based on the idea that all the above developmental areas of a child can be connected and form a specific sequence, based on the social meaning they contain which is developed in an appropriate way. Sociability is the primary area of development, followed by the areas of socialization, communication, play, language, speech, and writing. Other areas are strongly connected with the primary area of sociability. The final results of the DPSC provide a profile that can help parents and specialists understand a child’s main difficulties regarding social communication needs as well as a communication context for planning the appropriate intervention strategy.

## **Material and Methods**

### *Questionnaire*

The DPSC is based on the communication and language development of children with social communication difficulties. DPSC facilitates the understanding of the challenges these children face in their social interactions, communication, and linguistic development. DPSC uses a 3-scale rating of answers with the options “Yes,” “Emerging,” or “No.” It utilizes the responses of clinicians and parents to build an individual developmental profile of the child. This profile can enable clinicians to determine the therapeutic goals for improved cooperation and communication in various contexts.

The DPSC is based on the theory of the Circle Model, which focuses on the development of abilities such as socialization, communication, play, language, speech, and writing, in addition to sociability, which comprises the core ability of development due to the fact that it infuses all the other abilities with social meaning [59]. The questionnaire is being applied for the first time and is evaluated according to age, sex, and area of residence. The DPSC is available via Google Forms in Greek language via the following link: <https://docs.google.com/forms/d/e/1FAIpQLSc9-lhGYE6igQhgXatLIAQvCCOT5a93L-rOSfZFCaCfr7o3ag/viewform?vc = 0&c = 0&w = 1>.

### Psychometric Properties

The DPSC was designed based on the abovementioned theory and consists of 112 questions concerning 7 areas of development: Sociability (Cronbach's  $\alpha = 0.847$ ), Socialization (Cronbach's  $\alpha = 0.802$ ), Communication (Cronbach's  $\alpha = 0.756$ ), Play (Cronbach's  $\alpha = 0.828$ ), Language (Cronbach's  $\alpha = 0.839$ ), Speech (Cronbach's  $\alpha = 0.676$ ) and Writing (Cronbach's  $\alpha = 0.797$ ), with an extremely high overall reliability (Cronbach's  $\alpha = 0.954$ ). In addition, the questionnaire exhibits high content validity, as it was constructed by a panel of experts in the field of logopaedics who evaluated the tool and suggested significant amendments to improve on the initial version [60]. This panel of experts consisted of 25 specialists assigned to evaluate if the presented framework contained the appropriate items. They used a 3-scale score: 1 = not necessary, 2 = useful but not essential, and 3 = essential." Content validity was quantified using the formula:

$$CVR = (N_e - N/2)/(N/2),$$

in which  $CVR$  is the content validity ratio,  $N_e$  the number of panelists indicating "essential," and  $N$  the total number of panelists [61]. For almost all items of the questionnaire, a total of 20 specialists agreed that each item should be included in the specific structure; for the questionnaire in total, a CVR of 60% was reported. According to Lawshe [61], the minimum

CVR for a questionnaire to be considered as valid is 37% for a panel of 25 participants; this ensures the content validity of each structure of the questionnaire.

Furthermore, regarding content validity, one of the first research approaches regarding the DPSC involved obtaining the opinions of specialists about it and its usefulness. More than 70% of the specialists who participated had a master's degree and >50% had >5 years' clinical experience. Their answers revealed that 95% felt the DPSC helped them to understand ASD better, describe the intervention plan more accurately, and collaborate better with other clinicians. It also gave them better opportunities to explain the difficulties associated with the disorder to the parents of the affected children in a more effective way. Lastly, the most promising result was that all clinicians who took part answered that the DPSC enhanced their understanding of the developmental process of social communication [62].

The questions in each area have a developmental evolution, starting with the early abilities developed in the specific developmental area.

### *Participants*

In the context of this study, a total of 357 parents participated and provided answers for their children, 51.3% of whom were female and 48.7% male; 2.5% of the children lived in rural areas, 89.6% in urban areas, and the rest (7.8%) in semi-rural areas. Regarding age, 10.4% of children were between 0 and 30 months, 29% between 30 and 42 months, 40.6% between 42 and 54 months, 10.4% between 54 and 66 months, 4.1% between 66 and 78 months, 3.9% between 78 and 90 months and 1.6% >90 months. Due to the small number of children >90 months of age, the observations of this age group were not included in the final sample.

### *Procedure*

For research purposes, the DPSC questionnaire was created and administered electronically via Google Forms to the parents of children aged 2–8 years with typical

development. The selection of this sample was random and was conducted using stratified sampling techniques, according to the child's age, gender, and region of residence.

The questionnaire uses a scale of 3 options for answers. Parents had the opportunity to ask for clarification of the questions, via e-mail, from the members of the research team.

### *Statistical Analysis Method*

Multiple-way ANOVA and non-parametric models were applied to assess the impact of various independent variables on questionnaire structures. ANOVA is a statistical technique used to examine if the means of  $\geq 2$  groups differ significantly. Specifically, it evaluates the impact of  $\geq 1$  factors by comparing the means of different samples.

Dependent variables were socialization, sociability, language, play, speech, writing, and communication. Independent variables for the ANOVA and non-parametric models were the child's age (in months), gender, and area of residence.

A 3-way ANOVA model without interactions between independent variables was used when the following conditions were met:

- a) a dependent variable's distribution was approximately normal,
- b) there was homogeneity of dependent variables' variances across all levels of independent variables,
- c) measures of dependent variables' values were independent, i.e., the dataset comprised different participants with unique responses, rather than multiple responses per participant.

For cases where condition (a) or (b) was not met, the non-parametric Kruskal-Wallis test was applied to each independent variable separately, without including interaction terms in the model. The Kruskal-Wallis test is a non-parametric (distribution-free) test used when the assumptions of one-way ANOVA are not met. Both the Kruskal-Wallis test and one-way ANOVA evaluate significant differences on a continuous dependent variable by a categorical independent variable (with  $\geq 2$  groups). In the ANOVA, it is assumed that the dependent variable is normally distributed and there is approximately equal variance of the scores across groups.

However, when using the Kruskal-Wallis test, one does not have to make any of these assumptions, meaning the test can be used for both continuous and ordinal-level dependent variables. However, as with most non-parametric tests, the Kruskal-Wallis test is not as powerful as ANOVA.

## Results

In this section, the results of the developmental questionnaire assessment are described. The first section corresponds to the descriptive analysis and the second to hypothesis testing.

### *Descriptive Statistics*

The study sample consisted of children, 48.7% of whom were boys and 51.3% were girls (Table 1). Mean age for all the participants was 45.87 (SD 13.86) months. Roughly, boys were older (mean age 46.48 [SD 14.10] months) than girls (mean age 45.29 [SD 13.04] months), but this difference was not statistically significant at a 5% level of confidence ( $t_{355} = 0.827$ ,  $p = 0.409$ ).

Concerning the regions from which the sample was collected, 2.5% of children lived in rural, 7.8% in semi-rural areas, and the majority of 89.6% in urban areas. Mean age of children was 39.56 (SD 12.67) months in rural areas, 46.29 (SD 13.48) months in urban areas, and 43.07 (SD 14.34) months in semi-rural areas. These differences were not statistically significant at 5% ( $F_{2, 354} = 1.734$ ,  $p = 0.178$ ).

Regarding the dependent variables of this study, these were averaged by each structure. In Table 2, the pairwise correlation for all dependent variables is presented. Correlation for all variables was positive, indicating that scores between any 2 pairs of variables tended to increase or decrease in the same direction. A medium-to-high positive and statistically significant correlation was observed between the socialization and sociability scores ( $r[N = 357] = 0.648$ ,  $p < 0.01$ ), sociability and language scores ( $r[N = 357] = 0.624$ ,  $p < 0.01$ ), play and

language scores ( $r[N = 357] = 0.623, p < 0.01$ ), and sociability and communication scores ( $r[N = 357] = 0.612, p < 0.01$ ). The only not statistically significant, merely positive correlation was observed between writing and speech ( $r[N = 357] = 0.072, p > 0.05$ ).

### *Hypothesis Testing*

In this section, 3-way ANOVA models without interactions were estimated, using the structures of the developmental questionnaire as dependent variables, i.e., sociability, socialization, communications, language, play, speech, and writing. Sex, residential area, and the child's age in years were divided into 7 categories considered as independent variables.

Variances of dependent variable were equal across all levels of independent variables and so homogeneity of variances was achieved across all dependent variables:  $F_{26, 330} = 0.938, p = 0.554$  for sociability;  $F_{26, 330} = 0.794, p = 0.755$  for socialization;  $F_{26, 330} = 0.753, p = 0.806$  for communication;  $F_{26, 330} = 1.417, p = 0.088$  for play; and  $F_{26, 330} = 0.725, p = 0.837$  for speech.

The results indicated that mean values for play differ significantly for boys and girls ( $F_{1, 348} = 4.882, p = 0.028$ ) and also that age affected the score for play in statistically significant manner ( $F_{5, 348} = 5.286, p = 0.000$ ). Furthermore, age was a statistically significant factor for sociability structure ( $F_{5, 348} = 6.723, p = 0.000$ ). The effects of gender, age, and residential area were not statistically significant for socialization and communication structures, when applying 3-way ANOVA without interactions.

Due to the violation of normality and/or homogeneity of variances, the estimation of 3-way ANOVA for the dependent variables writing and language was infeasible. Non-parametric tests were thus applied to investigate the existence of statistically significant differences in dependent variables across the levels of independent variables. For gender, the Mann-Whitney U test was applied and the Kruskal-Wallis test was applied for all other variables.

Scores for language and writing were not statistically significantly for boys and girls, at a 5% level of significance ( $Z = -1.497, p = 0.134$  and  $Z = -0.128, p = 0.898$ , respectively). Mean values for language and writing were equal for the independent variable residential area ( $X^2[N =$

357,  $df = 2$ ] = 5.076,  $p = 0.079$  and  $\chi^2[N = 362, df = 2] = 4.457, p = 0.108$ , respectively). Conversely, values of language and writing constructs differed statistically significantly among different age groups in years ( $\chi^2[N = 357, df = 6] = 47.802, p = 0.000$  and  $\chi^2[N = 357, df = 5] = 83.219, p = 0.000$ , respectively).

We also applied preliminary descriptive statistics for each dependent variable, in which mean scores close to 1 or 2 suggested that children had difficulty when performing a particular skill, while a mean score close to 3 indicated that children did not have the ability to perform the skill.

Children in the age range 0–30 months tended to have lower sociability scores (mean 1.47 [SD 0.26]) than older children, i.e., in the age range 30–42 months (mean 1.37 [SD 0.30]). As a child's age increased, the socialization score improved. Upon visual inspection, for almost all dependent variables, differences between ages confirmed the robustness of the DPSC tool, although these differences were mostly obvious in the areas of language and writing.

## Discussion

The DPSC questionnaire has been tested against reliability and validity. The CVR was assessed by a panel of 25 specialists in the field and then computed for each item in the questionnaire. The results show that the content validity of each construct is ensured, as the CVR index of 60% exceeds the minimum of 37%, and so the questionnaire can be characterized as valid. ~~All~~ Almost all structures exhibit high internal consistency as Cronbach's  $\alpha$  index exceeds 70%, while the overall reliability of this questionnaire is outstanding. Results indicated a strong correlation between all variables of DPSC. Pairwise correlations revealed that scores between any 2 pairs of variables tended to increase or decrease in the same direction. A positive correlation was observed between the first 5 sectors (sociability, socialization, communication, play, and language) and a merely positive correlation between the

last 2, i.e., speech and writing. Statistically, age affected, significantly, 4 out of 7 structures. For almost all structures, older children tended to possess the skills when compared to younger children. Residential area and sex were not statistically significant factors, which implies that the sampling procedure was implemented appropriately. These preliminary results indicate a robust and reliable assessment tool for addressing difficulties concerning the domains of sociability, socialization, communication, play, language, speech, and writing from an early age.

Results indicate that the mean scores of all questions in every sector decreased proportional to age groups, from emerging to existing. In other words, all aspects evaluated in DPSC sectors are answered as “existing” as children get older; this evaluation of social, communication, play, language, speech, and writing skills is supported by other researchers [10–13, 22, 25, 33, 45, 57].

Additionally, the findings presenting a statistically significant difference regarding the areas of language and writing, confirming that the DPSC follows the developmental stages. In these 2 areas (language and writing) typical developing children at the age of 2-9 years present more concrete developmental differences and the DPSC displayed adequate sensitivity in addressing these developmental stages.

Findings in the areas of language and writing, regarding differences between age groups, are viewed by other researchers as different cognitive levels [37, 39, 58]. In this study, there were differences in the area of language regarding skills, such as participation in a discussion, starting a discussion, a variety of discussion topics, the use of language in problem-solving, and understanding humor and idioms. Writing areas revealed differences in skills, such as copying letters, reading ability, comprehension of a reading passage, the use of written language to convey a message, and writing a narrative.

Findings regarding sociability, socialization, communication, and play which did not differ in the different age groups could be explained by the type of skills that were included in the

DPSC questionnaire. These skills present early in life and accompany the person throughout their lifetime, i.e., skills in the areas of sociability, social interaction, eye contact, group membership, social relations with peers, understanding feelings, understanding the intentions of others, and so on. These abilities, according to Johnson [63] and Pratt and Bryant [64], present until 3 years of age in children with typical development. The socialization skills in the DPSC questionnaire were related to early-developed skills, such as imitation, adaptation, generalization of learned skills, learning behaviours from others, and self-regulating one's behaviour. These skills are also presented early in life according to research findings [65, 66]. The findings for play did not produce differences at different ages; this can likewise be explained because the play skills evaluated in the DPSC questionnaire present in the early stages of development. Moreover, these results can be explained by the fact that skills pertaining to play, such as sensorimotor play, functional play, symbolic play, and role-playing, are abilities that emerge by the fourth year of life or earlier [13, 21, 26].

Results indicated that the answers in the area of sociability play a substantial role in the way all the other areas were answered by the parents. Joint attention skills, crucial in the early years of life and evaluated in the sector of sociability, seemed to play a substantial role in the development of the rest of the sectors. Early-developed social skills, which are administered in the DPSC, were significant factors for emerging skills regarding imitation, communication, and language.

Social skills, joint attention skills, and social interaction skills already developed in the first area provided a sliding scale in the completed profile of answers.

Summarizing the results that indicated a significant difference between the sectors, it can be assumed that better results in sociability were inextricably linked with better outcomes in the other sectors, such as early social skills which help children to develop other aspects of development in a typical manner.

Other findings from this research relating to the sex and the child's place of residence supported the sensitivity of the questionnaire regarding the collection of data about social communication skills. The fact that, in all areas of the DPSC, no statistical differences between boys and girls were found, or between rural, semirural, and urban residence, highlighted that the questionnaire was not influenced by or related to these factors. The social communication abilities were generic at the ages focused on in this study.

### *Limitations of the Study*

This is one of the first developmental studies in Greece to investigate social communication skills in typically developing children. However, several factors dictate that these results should be interpreted with caution. First, the small number of the sample in the older age group (>7 years) did not allow for the interpretation of any prevalence. In addition, we extracted significant results for children in different age groups who lived in the same area, but not between age groups or different residential areas. This aspect should be reconsidered. Collecting data from the parents, without the assessment of a specialist, increased the possibilities of some of the answers being inaccurate. Finally, sociability, socialization, communication, play, and speech were not related to the subject's age when a 3-way ANOVA design with interactions was implemented. Removing interactions, age is a statistically significant factor for sociability and play structures. This fact implies that the study would suffer from increased type I error probability, so the complete research design should include interactions between all independent variables of this study. Future research with the DPSC should be conducted.

### *Clinical Implications*

The use of the DPSC as a tool for the recognition and identification of difficulties in different aspects of development will facilitate better communication between specialists and parents. The final results extracted from the DPSC about a child with social communication

needs will help clinicians formulate individual therapeutic intervention plans according to the major aspects of sociability, instead of planning training in peripheral aspects of development, such as play, language, speech, and/or writing.

### **Acknowledgement**

We acknowledge the support of the parents who filled out the questionnaire for the research.

### **Statement of Ethics**

The parents of the children who filled in the questionnaire via Google forms gave their permission and consent in the first page of the questionnaire where they confirmed the processing of their questions as well as their demographic data. The project was approved by the Municipality of Nikaia – Attica, Social Protection and Education Department.

### **Conflict of Interest Statement**

The authors declare that they have no conflicts of interest.

### **Funding Sources**

There was no funding support.

### **Author Contributions**

I.V. and E.N.C.: DPSC creation. N.P.: statistical analysis.

## References

- 1 Dawson G. Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. *Dev Psychopathol*. 2008;20(3):775–803.
- 2 Shevell MI. Present conceptualization of early childhood neurodevelopmental disabilities. *J Child Neurol*. 2010 Jan;25(1):120–6.
- 3 American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington (DC): American Psychiatric Association; 1994.
- 4 Oberklaid F, Efron D. Developmental delay—identification and management. *Aust Fam Physician*. 2005 Sep;34(9):739–42.
- 5 American Academy of Pediatrics. Section on Ophthalmology, Council on Children with Disabilities, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, American Association of Certified Orthoptists, Joint Statement—Learning Disabilities, Dyslexia and Vision. *Pediatrics*. 2009;124(2):837–44.
- 6 Baker M, Schafer G, Alcock KJ, Bartlett S. A parentally administered cognitive development assessment for children from 10 to 24 months. *Infant Behav Dev*. 2013 Apr;36(2):279–87.
- 7 [Soheir S, Maha A, Wafaa M, Naglaa F. Screening for developmental delay in preschool- aged children using parent-completed Ages and Stages Questionnaires: additional insights into child development. Postgrad Med J. 2017; 93:597–602.](#)
- ~~8 [Abo El Elella SS, Tawfik MA, Abo El Fotoh WM, Barseem NF. Screening for developmental delay in preschool-aged children using parent-completed Ages and Stages Questionnaires: additional insights into child development. Postgrad Med J. 2017 Oct;93\(1104\):597–602.](#)~~
- 8 Cattell RB. *Personality and motivation structure and measurement*. World Book Co.; 1957.

- 9 Carpenter M, Nagell K, Tomasello M. Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monogr Soc Res Child Dev.* 1998;63(4):1–143.
- 10 Adamson LB, Chance SE. Coordinating attention to people, objects, and language. In: Wetherby AM, Warren SF, Reichle J, editors. [Transitions in prelinguistic communication](#). Volume 7. 1998. pp. 15–37.
- 11 Brooks R, Meltzoff AN. The importance of eyes: how infants interpret adult looking behavior. [Dev Psychol.](#) 2002 Nov;38(6):958–66.
- 12 Kristen S, Sodian B, Thoermer C, Perst H. Infants' joint attention skills predict toddlers' emerging mental state language. [Dev Psychol.](#) 2011 Sep;47(5):1207–19.
- 13 Charman T, Baron-Cohen S, Swettenham J, Baird G, Cox A, Drew A. Testing joint attention, imitation, and play as infancy precursors to language and theory of mind. [Cogn Dev.](#) 2000;15(4):481–98.
- 14 Schaffer HR. [Social development](#). Blackwell Publishing; 1996.
- 15 Cochet H, Byrne RW. Communication in the second and third year of life: relationships between nonverbal social skills and language. [Infant Behav Dev.](#) 2016 Aug;44:189–98.
- 16 Toth K, Munson J, Meltzoff AN, Dawson G. Early predictors of communication development in young children with autism spectrum disorder: joint attention, imitation, and toy play. [J Autism Dev Disord.](#) 2006 Nov;36(8):993–1005.
- 17 Meltzoff AN, Moore MK. Imitation of facial and manual gestures by human neonates. [Science.](#) 1977 Oct;198(4312):75–8.
- 18 Carver LJ. A mosaic of nine-month-olds' memories: Looking time, ERP, and elicited imitation measures. Poster presented at the biennial meeting of the Society for Research in Child Development. Indianapolis: 1995.
- 19 Meltzoff AN. Infant imitation and memory: nine-month-olds in immediate and deferred tests. [Child Dev.](#) 1988 Feb;59(1):217–25.

- 20 Meltzoff AN. Origins of theory of mind, cognition and communication. *J Commun Disord.* 1999 Jul-Aug;32(4):251–69.
- 21 Bates E, Benigni L, Bretherton I, Camaioni L, Volterra V. The emergence of symbols: Cognition and communication in infancy. New York: Academic Press; 1999.
- 22 Bullowa M. *The Beginning of Interpersonal Communication.* Cambridge: Cambridge University Press; 1979.
- 23 Seibert J, Hogan A, Mundy P. Assessing Interactional Competencies: The Early Social-Communication Scales. *Inf Mental Hlth J.* 1982;3(4):244–58.
- 24 Bloom L. The transition from infancy to language: Acquiring the power of expression. New York: Cambridge University Press; 1993. pp. 21–34.
- 25 Lifter K, Bloom L. Intentionality and the role of play in the transition to language. In: Wetherby AM, S. Warren F, Reichle J, editors. Transitions in prelinguistic communication. Baltimore: Paul H. Brookes Publishing Co; 1998. Vol. 7; pp. 161–195.
- 26 Piaget J. *Play, dreams, and imitation in childhood.* New York: Norton; 1952.
- 27 McCune L. A normative study of representational play at the transition to language. *Dev Psychol.* 1995;31(2):198–206.
- 28 Ungerer JA, Sigman M. The relation of play and sensorimotor behavior to language in the second year. *Child Dev.* 1984 Aug;55(4):1448–55.
- 29 Clift S, Stagnitti K, Demello L. A validation study of the test of pretend play using correlational and classificational analyses. *Child Lang Teach The.* 1998;14(2):199–209.
- 30 Doswell G, Lewis V, Sylva K, Boucher J. Validation data on the Warwick Symbolic Play Test. *Eur J Disord Commun.* 1994;29(3):289–98.
- 31 Lewis V, Boucher J, Lupton L, Watson S. Relationships between symbolic play, functional play, verbal and non-verbal ability in young children. *Int J Lang Commun Disord.* 2000 Jan-Mar;35(1):117–27.

- 32 O'Reilly A W, Painter KM, Bornstein MH. Relations between Language and Symbolic Gesture Development in Early Childhood. *Cogn Dev*. 1997;12:185–97.
- 33 Thal DJ, Bates E, Goodman J, Jahn-Samilo J. Continuity of language abilities: an exploratory study of late and early talking toddlers. *Dev Neuropsychol*. 1997;13(3):239–73.
- 34 Herlihy L, Knoch K, Vibert B, Fein D. Parents' first concerns about toddlers with autism spectrum disorder: effect of sibling status. *Autism*. 2015 Jan;19(1):20–8.
- 35 Suma K, Adamson LB, Bakeman R, Robins DL, Abrams DN. After early autism diagnosis: changes in intervention and parent–child interaction. *J Autism Dev Disord*. 2016 Aug;46(8):2720–33.
- 36 Bruner J. *Child's talk: Learning to use language*. New York (NY): W. W. Norton; 1983.
- 37 Mundy P, Block J, Delgado C, Pomares Y, Van Hecke AV, Parlade MV. Individual differences and the development of joint attention in infancy. *Child Dev*. 2007 May–Jun;78(3):938–54.
- 38 Bottema-Beutel K. Associations between joint attention and language in autism spectrum disorder and typical development: A systematic review and meta-regression analysis. *Autism Res*. 2016 Oct;9(10):1021–35.
- 39 Mundy P, Delgado C, Hogan A. A manual for the abridged Early Social Communication Scales (ESCS). Miami FL: Department of Psychology, University of Miami; 2003.
- 40 Adamson LB, Bakeman R, Suma K, Robins DL. An Expanded View of Joint Attention: Skill, Engagement, and Language in Typical Development and Autism. *Child Dev*. 2019 Jan;90(1):e1–18.
- 41 Bowen C. *Children's speech sound disorders*. 2nd ed. Chichester: Wiley Blackwell; 2015.
- 42 Baker E, Croot K, McLeod S, Paul R. Psycholinguistic models of speech development and their application to clinical practice. *J Speech Lang Hear Res*. 2001 Jun;44(3):685–702.

- 43 Levelt WJ. Models of word production. [Trends Cogn Sci](#). 1999 Jun;3(6):223–32.
- 44 Waring R, Rickard Liow S, Eadie P, Dodd B. Speech development in preschool children: evaluating the contribution of phonological short-term and phonological working memory. [J Child Lang](#). 2019 Jul;46(4):632–52.
- 45 Nijland L, Terband H, Maassen B. Cognitive functions in childhood apraxia of speech. [J Speech Lang Hear Res](#). 2015 Jun;58(3):550–65.
- 46 Torrington Eaton C, Ratner NB. An exploration of the role of executive functions in preschoolers' phonological development. [Clin Linguist Phon](#). 2016;30(9):679–95.
- 47 Jacquemot C, Scott SK. What is the relationship between phonological short-term memory and speech processing? [Trends Cogn Sci](#). 2006 Nov;10(11):480–6.
- 48 Pierce LJ, Genesee F, Delcenserie A, Morgan G. Variations in phonological working memory: linking early language experiences and language learning outcomes. [Appl Psycholinguist](#). 2017;38(6):1265–300.

49 [Mody M, Manoach D S, Guenther F H, Kenet T, Bruno K A, McDougle C J, Stigler K A. Speech and language in autism spectrum disorder: a view through the lens of behaviour and brain imaging , Future Medicine Ltd Neuropsychiatry 2013. 3\(2\), 223–232](#)

Kanner L. ■■■■■■■■■■■■■■■■.

~~50 — Mody M, Manoach DS, Guenther FH, Kenet T, Bruno KA, McDougle CJ, et al. Speech and language in autism spectrum disorder: a view through the lens of behaviour and brain imaging. [Neuropsychiatry](#). 2013;3(2):223–32.~~

504 Wei X, Wagner M, Christiano ER, Shattuck P, Yu JW. Special education services received by students with autism spectrum disorders from preschool through high school. [J Spec Educ](#). 2014 Nov;48(3):167–79.

512 Zajic MC, McIntyre N, Swain-Lerro L, Novotny S, Oswald T, Mundy P. Attention and written expression in school-age, high-functioning children with autism spectrum disorders. [Autism](#). 2018 Apr;22(3):245–58.

- 523 Jones CR, Happé F, Golden H, Marsden AJ, Tregay J, Simonoff E, et al. Reading and arithmetic in adolescents with autism spectrum disorders: peaks and dips in attainment. *Neuropsychology*. 2009 Nov;23(6):718–28.
- 534 Ricketts J, Jones CR, Happé F, Charman T. Reading comprehension in autism spectrum disorders: the role of oral language and social functioning. *J Autism Dev Disord*. 2013 Apr;43(4):807–16.
- 545 Randi J, Newman T, Grigorenko EL. Teaching children with autism to read for meaning: challenges and possibilities. *J Autism Dev Disord*. 2010 Jul;40(7):890–902.
- 5556 Whitby PJ, Travers JC, Harnik J. Academic achievement and strategy instruction to support the learning of children with high-functioning autism. *Beyond Behav*. 2009;19:3–9.
- 567 MacArthur CA, Graham S, Fitzgerald J. *Handbook of Writing Research*. New York: Guilford Press; 2015.
- 578 Hayes JR. Modeling and remodeling writing. *Writ Commun*. 2012;29(3):369–88.
- 589 Vogindroukas I, Grigoriadou E, Kampouroglou M. *Test of Receptive and Expressive Language Abilities*. Greece: Glafki Publications; 2009.
- 5960 Rubio DM, Berg-Weger M, Tebb SS, Lee ES, Rauch S. Objectifying content validity: conducting a content validity study in social work research. *Soc Work Res*. 2003;27(2):94–104.
- 604 Lawshe CH. A quantitative approach to content validity 1. *Person Psychol*. 1975;28(4):563–75.
- 612 Vogindroukas I, Chelas E. Developmental Profile of Social Communication – Model of Circles: Better understanding of social communication deficit in developmental disorders 2016. 30th World congress IALP. Dublin.
- 623 Johnson SC. The recognition of mentalistic agents in infancy. *Trends Cogn Sci*. 2000 Jan;4(1):22–8.

- 634 Pratt C, Bryant P. Young children understanding that looking leads to knowing (so long as they are looking into a single barrel). *Child Dev.* 1990 Aug;61(4):973–82.
- 645 Tager-Flusberg H. What language reveals about the understanding of minds in children with autism. In: Baron-Cohen S, Tager-Flusberg H, Cohen DJ, editors. *Understanding other minds: perspectives from autism*. Oxford University Press; 1993.
- 656 Whiten A. *Natural theories of mind*. Oxford: Basil Blackwell; 1991.

Appendix after References (Editorial Comments)

Legend(s)

Table(s)

Footnote(s)

**Table 1.** Descriptive statistics

	Age, months			
	count	%	mean	SD
Sex				
Boys	174	48.7	46.48	14.10
Girls	183	51.3	45.29	13.04
Residential area				
Rural	9	2.5	39.56	12.67
Urban	320	89.6	46.29	13.48
Semi-rural	28	7.8	43.07	14.34

**Table 2.** Pearson pairwise correlation between dependent variables

	Sociability	Socialization	Communication	Language	Play	Speech	Writing
Sociability	1						
Socialization	0.648**	1					
Communication	0.614**	0.589**	1				
Language	0.624**	0.479**	0.612**	1			
Play	0.564**	0.460**	0.565**	0.623**	1		
Speech	0.106*	0.175**	0.202**	0.156**	0.230**	1	
Writing	0.435**	0.310**	0.376**	0.541**	0.391**	0.072	1

\*\*  $p < 0.01$ , \*  $p < 0.05$ .