

Assessing School Readiness in Cyprus

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Abstract

School readiness is a concept used to describe a set of necessary prerequisites for a child's satisfactory transition to the schooling experience. It undoubtedly involves the complex, interdisciplinary and inter-depending relations between the child, school and family and leads to a dynamic perspective of this system, whose parts are inter-subsidized with the final aim to achieve the integration of the child into the Primary school system. This multidimensional view of school readiness sets the context for this paper, which reports on a study with an aim to establish a reliable diagnostic test for school readiness for Cypriot kindergarten children entering the primary school. We start with an overview of how school readiness has been measured internationally so far, and a review of the main findings in regards to such measures, like the association with children's background characteristics and their future performance. We then present our instrument and report on the results of our pilot investigations with a sample of 128 children aged 5.5 to 6.5 years old. Our methods and analysis include both the use of the Rasch model for the validation of our constructed school readiness measures, as well as further statistical models for the comparison of children of various backgrounds on these measures. We conclude with a discussion of our main findings and the implications from the use of the constructed measures for potential language disorders, and identification of possible weaknesses at the four measurable aspects of school readiness (cognitive, language, motor and emotional).

Key Words: *school readiness; transition to primary school; language skills; cognitive skills; motor skills; physical skills; social skills; multidimensional; bilingual children.*

1. INTRODUCTION: The importance of school readiness

Each child is unique, with an individual set of characteristics, and an individual developmental pattern which is influenced by both genetic and environmental conditions. The first five years in life are considered as the most critical for the lifelong learning of children. Early experiences and the environment set the stage for future development, school and life success. Both of them influence brain development and establish the neural connections that provide the foundation for language, reasoning, problem solving, social skills, behavior and emotional health. The importance of allowing today's children sufficient time to mature and develop, and to benefit socially and emotionally from their preschool life experiences, before starting school is emphasized by a lot of experts. (Andreson, R.M., 2010). Kaga (1999) stated that starting school is a "big deal"; it's an experience for the child, the educators and the family.

The concept of 'school readiness' has concerned early childhood educators and researchers at both preschool and primary school levels for several years Duncan, G.J., et al (2007). Children who have commenced school without developing vital readiness skills, have been identified as 'at risk' for their future academic, social and occupational success. The concept of 'school readiness' also encompasses an understanding of the developmental 'domains' considered relevant to a child's readiness to manage the complex demands of a formal school environment. 'School readiness' refers to the physical well-being and motor development, socio-emotional development, approaches toward learning, language and cognitive developmental and general knowledge as identified by the National Education Goals Panel (NEGP) Resource and Technical Planning Groups (Kagan et al. 1995,). Ideally, children should have achieved these milestones, under optimal circumstances, before they enter school. Thus, school readiness is not restricted to levels of cognitive development, but is multidimensional, involving physical, social, and emotional development as well as general approaches to learning. The results of 6 longitudinal set studies by Duncan, G. J. (2006) proved that the strongest predictors for later achievement are school-entry math, reading and attention skills. On the contrary socioemotional behaviors, were generally significant predictors for later academic performance, even among children with relatively high levels of problem behavior.

It is globally recognized that Early Childhood Education (ECE) plays a significant role into a child's formal education. A number of studies investigated the effect of ECE to improvements in school readiness for primary school; findings are uniform in this area and show that school readiness is an important predictor of both early school achievement (Forget-Dubois et al. 2007; Farrar et al. 2007), and later academic outcomes (e.g. at Grade 1, but also further ahead in educational progression) (Sylva et al. 2011). A review of 36 studies of ECE effectiveness also found "overwhelming evidence that ECCE can produce sizable improvements in school success" (Barnett 1995, p. 40).

The importance of the topic seems to be recognized across the world. Evidence from the Australian Research Alliance for Children and Youth (Farrar et al. 2007) acknowledges that the experiences of early childhood have lifelong implications for health, well-being, and development, including our ability to become productive, socially and emotionally adjusted members of society. For the US a major federal program, Head Start, initiated in 1963, and aimed at providing children in poverty the experiences necessary to start school on an equal basis with their same-age peers. Since its start, it is said to have been a 'barometer' for education's most controversial issues (Pigott and Israel 2005). This nationwide program was joined by other efforts. The National Research Council's Committee on the Prevention of Reading Difficulties in Young Children, for example, recommended the provision of environments that promote pre-literacy skills for all preschool children (Snow et al. 1998). In a similar joint effort the National Association for the Education of Young Children and the National Council of Teachers of Mathematics advocated in one of their statements, in 2002, high-quality mathematics education for 3 to 6 year old children.

The role of schools is definitely crucial in such efforts. Schools can improve the readiness of young children by making connections with local child care providers and preschools and by creating policies that ensure smooth transitions to primary schools. Children entering the first grade of primary school have varied early experiences, skills, and knowledge, language, socio-culture and family backgrounds. These ideas are supported by both professional bodies and the research community. When, for example kindergarten teachers were asked to report the factors they thought were associated with difficulties in school transition, among the most frequently mentioned are weakness in academic skills, social skills problems, troubles with following directions and difficulties with independent and group work (Rimm-Kaufman et al. 2000). Schools, therefore, must be ready to address the diverse needs of the children and their families in their community and be committed to the success of every child. The National Research Council and Institute on Medicine argued that "the elements of early intervention programs that enhance social and emotional development are just as important as the components that enhance linguistic and cognitive competence" (Shonkoff and Phillips 2000, p. 398-399).

Viewing school readiness as a complex, multifunctioning, interdisciplinary and inter-depending relation between the child, its family and the school leads to a dynamic visual angle of a model-system, whose parts are inter-subsidized with the final aim to achieve the integration of the child into the school system. This multidimensional view of school readiness sets the context for a strong campaign in favor of tomorrow's children. The purpose of this study was to establish a reliable test for School Readiness for Cypriot kindergarten children entering the primary school.

2. A brief review on the measurement and impact of school readiness

In the studies and research programs reported so far, there are two fundamental issues to be explored: the first is how school readiness is measured and the second is about its association with other variables of interest. Since the focus of this paper is to report on both of these two aspects as realized during the development and validation of a newly constructed instrument for the Cypriot educational system, a brief review of existing literature on the topic is considered useful at this stage. This will be followed by a short description of the system under investigation and then the methods utilized in this study.

2.1. Measuring School readiness

In the past, school readiness was understood in one of two ways: (a) it was either simply assumed based on chronological age, and children were admitted into school when they reached the designated age; or (b) it was thought of in terms of specific skills and competencies that could be measured and assessed against established norms and standards. Lately, a rethinking of what constitutes school readiness has occurred in the context of the increasing understanding of the importance of the development of the whole child, and the formative influences of the early years of childhood. Brown (2010) has also, recently, presented an instrumental case study which highlights the issues that arise for early educators who are asked to define the ready student within standards-based education environment, as well as the implications of these for reform policy.

Overall, current research highlights the importance of considering all aspects of a child's development when considering 'school readiness'. The central question here is then "how is school readiness measured or assessed". Earlier attempts to measure school readiness are dated back to the 1960s and 1970s with scales and screening tests such as the Ashton Index (Kingslake 1983), the Illinois Test of Psycholinguistic Abilities (Kavale 1981; Kirk and McCarthy 1961) and the McCarthy scales of children's Abilities (McCarthy 1972). The latter, for instance were designed to satisfy the need for a single instrument to measure the general intellectual level of young children and assess their strengths and weakness in 6 major areas: verbal, perceptual-performance, quantitative, general cognitive, memory and motor skills.

The literature review of the NEGP (National Education Goals Panel) (Kagan et al. 1995) is considered by many researchers as the guiding framework for the conceptualization of the multidimensionality of school readiness, in the current era. According to this framework, there are five necessary (but not sufficient) dimensions for characterizing a child's school readiness: physical health,

social/emotional development, approaches to learning, language and cognitive development (Kagan et al. 1995; Hair et al. 2006; Halle et al. 2012; Kagan and Rigby 2003). This appears to be the most influential framework, at least in the US, however others are also found in the literature, such as the Texas Education Agency Prekindergarten Guidelines (Riojas-Cortez and Bustos Flores 2009). Recent studies have also built on the profile work, which built on the NEGP dimensions (Hair et al. 2006; Halle et al. 2012) and used the Kindergarten Student Entrance Profile with latent class analysis to examine these profiles across social-emotional, physical and cognitive domains to identify school readiness groups (or classes) of students.

Another analytical framework used in various US based studies is the Early Childhood Longitudinal Study (ECLS) and in particular the Kindergarten cohort of 1998-99 (ECLS-K) (Hibel 2009; Pigott and Israel 2005; West et al. 2000). In the context of these studies, school readiness is measured in three domains: reading, mathematics and general knowledge, as well as teacher evaluation of students' task-related behaviors, also reported as 'approaches to learning'. The scores for each domain are calculated within an Item response theory perspective (an approach also employed for the results of this paper). Children are then identified as 'unready' in a domain if their scores fall within the lowest quintile. Other groups also used the same analytical framework in combination with a meta-analysis of longitudinal studies to report conclusions about the association of these dimensions of school readiness and later school achievement (Duncan et al. 2007; Claessens et al. 2008).

The Galileo System for the Electronic Management of Learning is another tool found relevant to school readiness assessment. This refers to a teacher measure used to track children's rates of change in 8 school readiness domains, among which language and literacy, early math, social and emotional, approaches to learning are frequently reported. The aforementioned four dimensions were also used in a recent US based study (Bell et al. 2013) where an IRT measurement perspective was also employed.

A study in Ireland (with some UK collaboration) reported the use of the Bury Infant Quick Check, developed by Pearson and Quinn in 1986, which includes 13 items designed to assess children's cognitive abilities as they manifest in the context of language expression and learning style (Kiernan et al. 2008). Finally, "Get Ready to Read" is used as a screening tool for measuring early reading skills in young children. The particular skills it measures are print knowledge, linguistic awareness and emergent writing (Phillips et al. 2010).

For the Greek speaking children an existing instrument, which was also partly employed for the current study, is the "Athena Test-diagnosis of Learning Disabilities" (Paraskevopoulos et al. 1999). The "Athena test" has been created based on the standards set by the Ashton Index (Kingslake 1983) and the Illinois Test of Psycholinguistic Abilities (Kavale 1981; Kirk and McCarthy 1961). The test includes 14 scales which assess various aspects of cognitive and linguistic skills.

2.2. Variations in School readiness

It is well acknowledged that a lot of children enter primary school with physical, social, emotional and cognitive limitations that could have been minimized or eliminated through early attention to their needs as well as the needs of their families. This multidimensional view of school readiness, as established within the various measurement instruments, also sets the context for a strong campaign in favor of tomorrow's children.

As already mentioned, results are overall consistent in respect to the significance of school readiness' effect on later school achievement (Forget-Dubois et al. 2007; Farrar et al. 2007; Pigott and Israel 2005; Sylva et al. 2011; Barnett 1995). Results of Duncan and colleagues (Duncan et al. 2007; Claessens et al. 2008) with the ECLS-K (US) study also found that initial academic skills, attention, and socio-emotional skills were the three key and most important elements for school readiness and for later school achievement in reading and mathematics. They also found, from a meta-analysis, that early math skills have the greatest predictive power, followed by reading skills and then attention. In a large study involving Canadian children, Duncan et al. (2007) found that maths skills at the point of school entry were the greatest predictor of a later academic performance in school, followed by reading and then attention skills. By contrast, measures of socio-emotional behaviors, including internalizing and externalizing problems and social skills, were generally insignificant predictors of later academic performance, even among children with relatively high levels of problematic behavior (Romano, Babchishin, Pagani, & Kohen, 2010). Patterns of association were similar for boys and girls and for children from high and low socioeconomic backgrounds. Language proficiency and early literacy skills were also found as key predictors of school success, enabling children to further develop cognitive skills and knowledge and to interact effectively with peers and adults (Snow et al. 1995).

Other studies have also investigated the differential school readiness by different background variables of children, such as ethnicity, race and socioeconomic background indicators. For example, some studies report on the disadvantaged school readiness of children from ethnic minority immigrants in general (Hibel 2009) or Mexican immigrants and Mexican American families (Riojas-Cortez and Bustos Flores 2009) and the Latino/a children in the USA (Quirk et al. 2013).

Kierman and colleagues (2008) reported that one third of their sample evidenced difficulties in respect to their cognitive abilities and socio-emotional skills. They also found that parental living situations, parenting skills and preschool attendance are significant predictors of school readiness. In another recent US study, Schaub (2013) also found that more educated parents participate more in cognitive activities with their young children (in 1991 and 2001), however this participation is increasing for all parents.

Associated with the above differential findings, are also efforts to improve school readiness either via governmental initiatives or other educational innovations. Such efforts were also found to be most effective when they embrace the rich cultural and language backgrounds of families and children. The strongest effects of high quality early childhood programs are found with at-risk children—children from homes with the fewest resources and under social and economic stress. A child's school readiness is a reflection of the environments in which they develop—their family, early childhood settings, schools, neighbourhoods and communities (CCCH, 2008a; Kagan & Rigby, 2003). "School readiness" is a term often used to refer to a child's cognitive, social and emotional skills upon entering school and their resulting ability to cope with the transition (Smart, Sanson, Baxter, Edwards, & Hayes, 2008).

3. The context of the current study

In Cyprus, the current policies for primary school entry focus solely on the child's chronological age and largely ignore the child's skills. This serves as the main "measure" for a child's school readiness and consequently his/her entry in the primary school. No consideration is taken into account regarding the developmental data, the different paces of maturation in an age-related team, the cognitive and linguistic differences, behavior differences, sentimental maturation, differences in the area of attention and concentration, the speed of treatment and the resistance or/and tiredness of the child.

There is overwhelming evidence that well-developed language skills are essential for a child to be ready to enter the primary school. Children need to be able to express themselves clearly using words rather than body language, express feelings and needs, communicate with peers and adults. Their vocabulary should be well developed and be using language creatively. Furthermore, they should be aware of the link between language and print, recognize their own name and the different symbols in the environment. Children need to be confident to ask help and assistance from adults, seek comfort from them when they hurt. They need to feel empathy for the person next to them and act in a mature way. These are essential skills for children to be able to deal with the complexity of the social demands of the school environment. It is absolutely important to have an overall evaluation before the child's integration in the school system so that he/she will be adequately serviced but also have the necessary support in the public school. Prevention is the best tactic for future academic success.

Starting school is an important time for young children, their families, and educators. It is a major challenge faced by children in their early childhood years (Victorian Department of School Education, 1992, p.44). It is a big step for all children and their families and a key life cycle transition both in and outside school (Pianta & Cox, 1999, p.xvii)

Thus it is essential to take into account the various aspects of children's development as well as their teachers' knowledge with regards to their growth and the divergences in their growth. Teachers' knowledge of the possibilities, the interests and the needs of each child as well as their knowledge of the social and cultural environment in which each child lives must be examined for more positive results. even more important for a successful integration of the child in the school system is the ability of the teachers to translate the developmental information they receive and put it in practice in a way that it will be suitable for the needs of each child is even more important (Dockett S. & Perry B., 2001)

Therefore, each school should evaluate thoroughly every child, make sure that the teachers know the child as a whole including family and social status, involve parents in the process of learning and give them adequate support and information to assist their child as well as to promote good collaboration with the parents. To do so, a user-friendly instrument, relevant to the Cypriot population, is needed to aid this process and to our knowledge no such instrument currently exists. The aim of this work is, thus, to fill in this gap, by providing a useful specialized instrument of a School Readiness Assessment to kindergarten children, administered just prior to entering the primary school to guarantee their school readiness a major factor for future success in academic, social and emotional course of life. This paper reports on the pilot studies regarding the development and validation of a 'school readiness' instrument based on Cyprus laws and regulations.

4. Methodology

In this section we briefly present the methods we employed for the development and validation of the instrument as well as some analytical considerations.

4.1. Instrumentation

As already mentioned the test was influenced a lot by the Greek “Athena Test” (Paraskevopoulos et al. 1999) from which different test items were taken and used as part of the test. This was mainly because this was an already established test trialed with the closely related, at least language-wise, Greek population. In addition some items were also adopted from the McCarthy scales of children's Abilities (McCarthy 1972). Furthermore, to extend the breath of the test, we also included activities on fine motor skills, eye hand coordination, and sound discrimination actions to screen the child's performance.

The assessment, overall, captures a variety of aspects in a child's development including academic, language and cognitive skills, social-emotional skills, physical-fine motor skills, environmental-social and communication skills. The instrument is split into two distinct parts, as described below:


Part A: The first part includes an individual-oral test examining the child's basic general knowledge, short term memory, basic linguistic, cognitive and mathematic significances, acoustic segregation, phonetic perception, sound acquisition and distinction, acoustic memory, description, narration, crisis and behavior. This part is done with the clinician. It lasts between 10-15 minutes, and assesses the child's performance, attitude, concentration, communication and social skills. During this oral assessment, language development and speech problems are identified for further assessment if needed. Some example questions/items from the oral part of the test are shown in Box 1:

- How many feet does a dog have?
- What day is it today?
- What is an airplane?
- Could you count for me the trees on this board? How many are there?
- Repeat the numbers after me: 4 6 8 6
- What would you do if someone takes from you something you are holding?
- Complete these sentences for me: Once upon a
The elephant is big, the mouse is

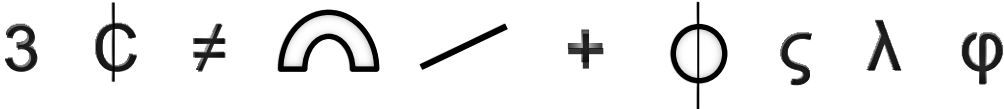
Box 1: Example tasks from the oral test

Part B: This part includes a written Exam that examines basic mathematic, linguistic pre-writing, pre-mathematic and pre-reading skills. In addition, it evaluates: fine mobility, copying shapes, draw-a-man, eye-hand co-ordination, knowledge, comprehension and implementation of directives, time of activities, behavior, attitudes of work, as well as the way of confrontation of situations and concentration. Some example items from the written part of the test are shown in Box 2. The test is administered in a classroom with a group of children. The clinician gives orally the instructions and the children execute. When one activity finishes they all move to the next one upon oral instruction. If they do not complete one item and time finishes, they just move on to the next and follow the flow of the group. No assistance is given by the teacher. The whole written assessment takes 50 minutes. During the assessment, the classroom teacher makes sure that the children have written their names and have understood all given instructions. If they did not, a note is put on the paper for later use.

Continue the pattern you see below:



Copy the following



Box 2: Example tasks from the written test

4.2. Administering the pilot test

The procedures for administrating the pilot test were as follows. The clinician would go to the school and would have 10-15 minutes on a face-to-face oral interrogation with the child in a quiet classroom. During the assessment the examiner would note all observations on the child’s overall behavior, the way he acted upon this interaction, the emotional and physical statuses of the child.

The written test was done in the classroom environment with the presence of the teacher. It is important to note that all children in Cyprus enter the kindergarten at age 4 years 8 months and they follow a structured national curriculum. All items tested are based on the core curriculum recognized by the Ministry of Education of Cyprus. All children follow the directives of the clinician to complete the written exam. Once finish all exam papers are collected to be scored by the clinician.

4.3. Subjects

Participants were 128 children, 61 boys (48%) and 67 girls (52%), ranging in age from 5.5 to 6.5 years old. The distribution of the subject’s age, both in months and days from the date of the test is given with the two histograms in Figure 1. It should be noted that information about age was only available for 92 children (71.3% of total sample).

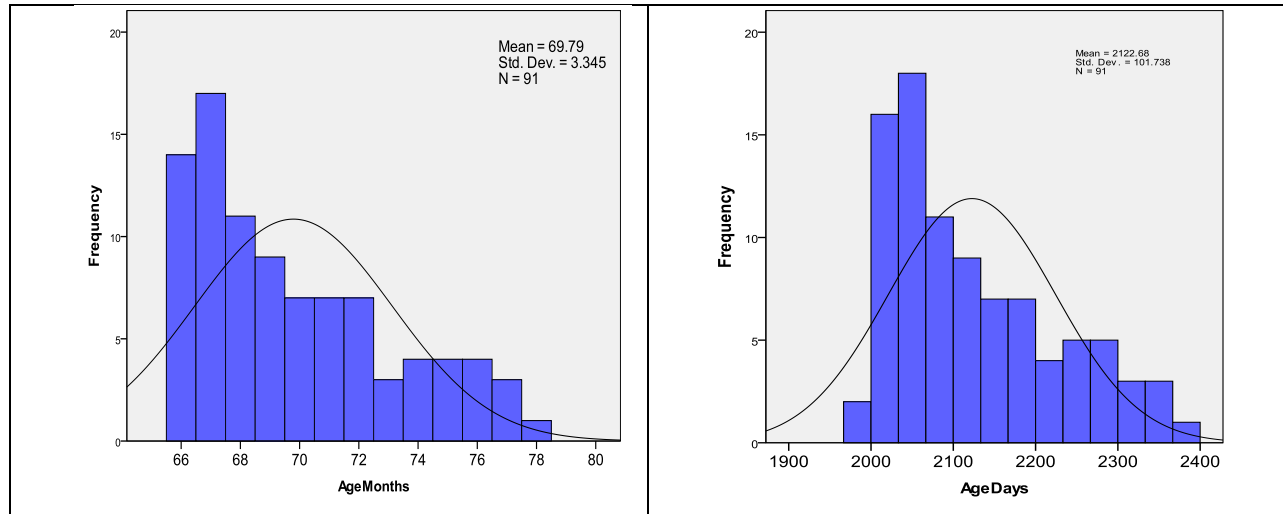


Figure 1: Participants’ age distribution in months (left) and days (right)

Table 1 presents further background information for the participants. As can be seen, the majority of children were recruited from urban and suburban areas of the island of Cyprus (77%), around the biggest towns in the south (Limassol, N=25) and Central (Capital-Nicosia, N=103). All children were attending private or public kindergarten. The personal data of the child were recorded by the classroom teacher including name, date of birth, school, classroom, teacher name, and nationality.

Table 1: Distribution of participants according to some background characteristics

Variable	Categories	Frequency	Percentage
Bilingual	No	109	85%
	Yes	19	15%
Area	Rural	29	23%
	Urban/suburban	99	77%
City Area	Nicosia	103	80.5
	Limassol	25	19.5

4.4. Data Coding and Analytical Methods

Once the data is collected, the information is coded into spreadsheets together with the background characteristics of the child. For items where there is correct and wrong answer only these are coded as 0 (for wrong) and 1 (for correct). For items with intermediate responses, or indicating increasing level of achievement, a score from 0 to the maximum available (usually 4) is employed for coding. These responses are then utilized for a sequence of analytical procedures. What we will focus on, in the remaining of the results section is the analysis of the overall scores of ‘school readiness’ as well as the four measurable sub-scales of ‘language’, ‘cognitive’, ‘motor’ and ‘emotional’ development of the child.

Our primary aim was to create these measures of ‘school readiness’ based on the developed instrument and also use this initial analysis to improve the instrument before using it to study a larger sample of students. Our psychometric analysis for this purpose was conducted within the Rasch measurement framework (a model within the Item Response Theory) following therefore the guidelines summarized by Wolfe and Smith Jr (2007a, 2007b) based on Messick’s (1989, 1988) validity definitions. The Rasch Model is widely used internationally in educational assessment and for educational attitudinal measures (Authors’ refs – removed) and

even more widely in health sciences. As also mentioned earlier, other groups have also employed similar procedures for school-readiness measurement (e.g. Hibel 2009; Pigott and Israel 2005; Duncan et al. 2007; Claessens et al. 2008).

The model is selected because it provides the means for constructing interval measures from raw data and because the total raw score is sufficient for estimation of measures. In our case, the data to be analyzed consist of dichotomous (0, 1), polytomous (0,1,2, 3 or 0,1,2,3,4) and Likert Type items, so we employed the one-parameter Rasch Partial Credit model. The model allows the item ‘difficulty’ (in our case the endorsement of each child care relevant statement) to be based on the way in which an appropriate group of subjects (i.e. the respondents) actually responded to that question. The model establishes the relative difficulty of each item stem in recording the development of an attitude from the lowest to the highest levels the instrument (i.e. this set of statements) is able to record (Wright and Mok 2000; Bond and Fox 2001; Andrich 1999). After data analysis, validity evidence was sought with the help of various statistics, i.e. item fit statistics, category statistics, differential item functioning (Thissen et al. 1993). It should be noted that the technical measurement results of this validation go beyond the scope and space limitations of this paper and, thus, are omitted.

With the Rasch analysis, as detailed above, we have been able to confirm the validity of 5 measures of school readiness, one for overall school readiness and four relevant to the following measurable sub-scales, namely:

- Cognitive
- Language
- Motor
- Emotional

It should be noted that the constructed variables are all in logits, and they constitute linear measures, which can be then employed in parametric statistical methods. In particular, each participant was assigned 5 scores in the above variables (as given by the person scores in Rasch analysis): the higher the score, the more ‘school ready’ the participant is.

Using these measures for children we then seek to explore how they relate with other variables of interest, such as children’s chronological age, gender, area of residence, and bilingualism. To achieve this we employ further statistical techniques, and tests such as comparisons of differences and correlations, as well as regression models to account for the effects of various independent variables (e.g. background) in regards to the dependent variable of interest (e.g. school readiness).

5. Results

Results are presented in different sub-sections to show the constructed measures and their respective relationship/associations with other variables.

5.1. The constructed measures of school readiness

The first section includes a descriptive presentation and analysis of the constructed measures to give an idea about their distribution. Figure 2 presents the distribution of the measure of overall ‘school readiness’ which was constructed including questions from the different sections of the test. As can be seen, this measure appears to be normally distributed with values ranging from around -2 to 4. The distributions of the remaining sub-dimensions are presented in Figure 3. Overall, all measures seem to be normally distributed and possess parametric properties that allow further statistical tests to be applied.

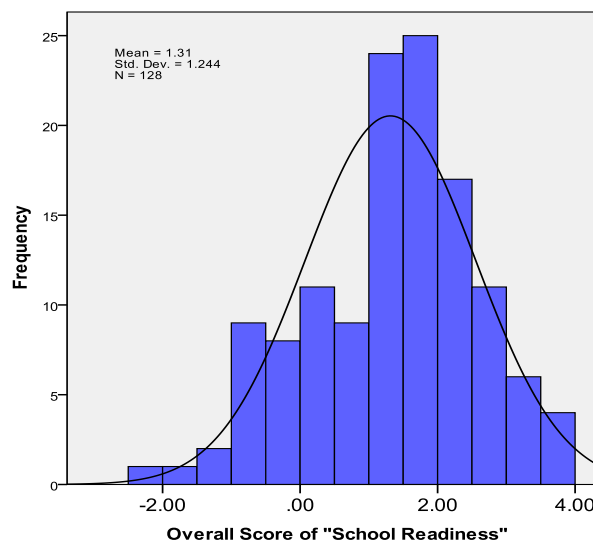


Figure 2: The distribution of the measure of ‘overall school readiness’

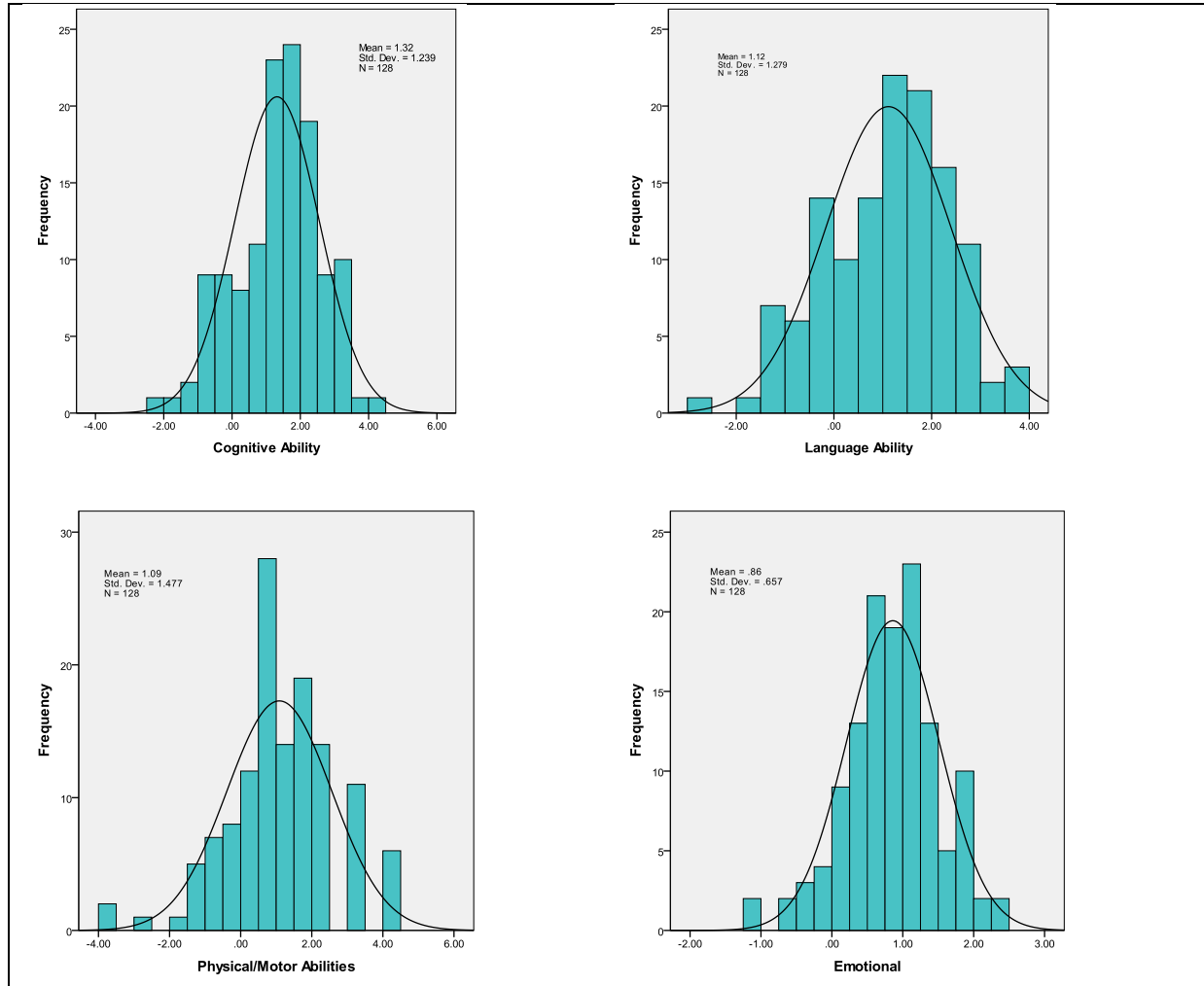


Figure 3: The distribution of the sub-dimensions of school readiness (cognitive and language on the top, motor and emotional at the bottom)

Table 2 presents the correlation coefficients for the associations between the four sub-dimensions we are exploring next, and as can be seen they are all positive and statistically significant at $p < 0.001$. The emotional dimension seems to be having the weakest association with the others, as denoted by the value (Note: correlation coefficients range from -1 to 1 with higher absolute values indicating stronger associations and 0 indicating no association).

Table 2: Pearson correlations between the 4 sub-domains of school readiness

	Language	Motor	Emotional
Cognitive	0.883	0.706	0.640
Language		0.589	0.620
Motor			0.443
All correlations are significant at $p < 0.001$			

5.2. The Association of the measures with children’s age

As already discussed, the age of children was recorded both in months and days. These two age variables were correlated with the 5 measures of school readiness with the use of Pearson Correlations. Table 3 shows the results of this analysis.

Table 3: Pearson correlations (and their p-values) between measures of school readiness and age variables

School readiness measures:	Age variable, in...	
	Days	Months
Overall	-0.167 (0.113)	-0.149 (0.158)
Cognitive	-0.188 (0.074)	-0.171 (0.106)
Language	-0.183 (0.083)	-0.166 (0.117)
Motor	-0.13 (0.221)	-0.124 (0.24)
Emotional	-0.188 (0.075)	-0.166 (0.115)

As shown in Table 3, even though not statistically significant, all measures of school readiness are found to be negatively associated with the age of children (both measured in days and months). This seemed like an odd result, so we explored it further: Figure 4 shows the mean children scores based on the season they were born in.

The figure sheds some light to the relationship (or better the inexistence of relationship) between age and scores, since as can be seen the highest scores (in all 4 measures) are observed for children born in autumn (which are amongst the younger groups in their academic year). This may also be viewed in light with the fact that the majority of girls in the sample were born in autumn (21 out of 45) compared to a more uniform distribution of boys in regards to this variable. This association will also be explored in further statistical modelling later on.

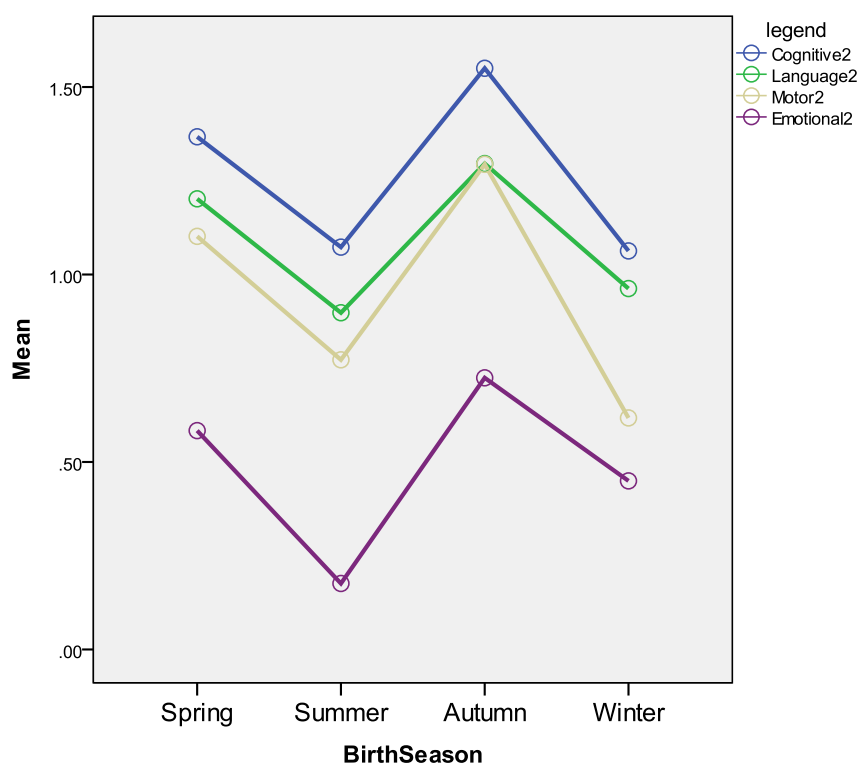


Figure 4: Mean scores at the four school readiness measures, by birth season

5.3. Measures differentiations by different background variables

In this section, we explore the effect of different individual and social background characteristics of the children on their scores in these school readiness measures. Table 4 shows the means on the five measures by gender group, as well as the t test for the significance of the differences between boys and girls. As can be seen, the only dimension with statistically significant differences is the motor one. The overall pattern is that girls appear to have scored slightly higher in all dimensions.

Table 4: Means for boys and girls for the overall and sub-measures and their comparisons via independent samples t-test

Measure	Groups: mean (SD)		t (d.f)	P
	Boy	Girl		
Overall	1.22 (1.36)	1.4 (1.13)	-0.821(126)	0.413
Cognitive	1.24 (1.36)	1.39 (1.13)	-0.645 (126)	0.52
Language	1.03 (1.39)	1.19 (1.17)	-0.724 (126)	0.471
Motor	0.8 (1.54)	1.35 (1.38)	-2.114 (126)	0.036

Emotional	0.51 (1.06)	0.67 (1.09)	-0.852 (126)	0.396
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Table 5 shows differences in the means on the measures based on the area the children come from. It is found that children from rural areas scored significantly lower in the overall score of school readiness as well as the 4 sub-dimensions.

Table 5: Means for rural and urban groups for the overall and sub-measures and their comparisons via independent samples t-test

Measure	Groups: mean (SD)		t (d.f)	P
	Rural	Urban		
Overall	0.19 (1.23)	1.64 (1.04)	-6.301 (126)	<0.001
Cognitive	0.26 (1.18)	1.63 (1.08)	-5.903 (126)	<0.001
Language	-0.02 (1.25)	1.45 (1.08)	-6.21 (126)	<0.001
Motor	0.29 (1.36)	1.32 (1.43)	-3.454 (126)	0.001
Emotional	-0.02 (1.04)	0.77 (1.02)	-3.668 (126)	<0.001

Table 6: Means for bilingual and non-bilingual groups for the overall and sub-measures and their comparisons via independent samples t-test

Measure	Groups: mean (SD)		t (d.f)	P
	No Bilingual	Bilingual		
Overall	1.46 (1.2)	0.5 (1.18)	3.214 (126)	0.002
Cognitive	1.46 (1.2)	0.48 (1.14)	3.299 (126)	0.001
Language	1.27 (1.23)	0.25 (1.21)	3.313 (126)	0.001
Motor	1.11 (1.5)	0.94 (1.34)	0.481 (126)	0.631
Emotional	0.65 (1.01)	0.29 (1.36)	1.34 (126)	0.183

Finally, Table 6 shows differences in the means on the measures based on whether the child is bilingual or not. According to the results, there are no significant differences between bilingual and native children in respect to motor and emotional development. However there are statistically significant differences in the cognitive, language and overall performance, with bilingual children scoring significantly lower.

5.4. Modelling School readiness with Linear Regression

Data analysis also employed Generalized Linear Modelling of the measures of school readiness regressed on the relevant (and available) children’s background information (i.e. gender, age, bilingualism, and area of origin), in order to account for potentially confounding effects of the explanatory variables. In particular Ordinary Least – Squares regression was employed in order to build an explanatory quantitative model for the constructed measures (Hutcheson and Sofroniou 1999; Hoffman 2004; Field 2009). The results for the overall measure are presented in Table 6:

Table 6: Model for Overall School Readiness

	Coefficient (b)	s.e.	t	P
(Constant)	0.816	2.59	0.315	0.753
Bilingual (Ref:No)	-0.914	0.435	-2.100	0.039
Age Days	0.000	0.001	-0.084	0.933
Gender (Ref:Girl)	-0.489	0.234	-2.086	0.040
Area (Ref:Rural)	1.484	0.278	5.336	<0.001

$F(4, 86) = 13.046, p < 0.001, R^2 = 0.378$ (Adjusted $R^2 = 0.349$)

$$\text{School Readiness Overall} = 0.816 - 0.914 * (\text{Bilingual: Yes}) + 0.00 * \text{Age Days} - 0.489 * (\text{Gender: Boy}) + 1.484 * (\text{Area: Urban}) \quad [\text{Eq. 1}]$$

The above model [Eq. 1] explains 37.8% of the variance of the response variable ($R^2=0.378$). According to the model, age (in days) has a negligible (and not significant) effect on the response variable (i.e. the measure of the overall School readiness). All other variables are shown to have a significant effect on the response variable, as indicated by the p-values ($p < 0.05$). The model also shows negative effect of the two categorical variables (which were dummy-coded for this analysis) of ‘bilingualism’ and ‘gender’. The effect of these variables “country” can be interpreted considering their dummy coding (i.e. for gender: Boys=1, Girls=0; for bilingual: Yes=1, no=0). Based on that, it can be inferred that as the gender changes from girls to boys, the measure of overall school readiness tends to decrease by an average of 0.489 (logits). Hence, overall the girls of this sample scored higher than the boys, after accounting for all other variables in the model. Similarly, bilingual children tend to score on average 0.9 logits lower than the native (non-bilingual) children, as indicated by the negative coefficient for this variable. The positive sign of the coefficient for ‘area’ should also be interpreted in a similar way (i.e. considering the dummy coding: rural=0, urban=1). Thus it can be said that, after accounting for all other variables in the model, children from urban areas tend to score almost 1.5 logits higher on overall school readiness than children from rural areas. Additionally, the size of the coefficients in the model, defines the relative association of the explanatory variables on the response variable, and in this case we can infer that leaving in rural areas has the stronger effect on lowering school readiness, followed by being bilingual, and then gender (being a boy).

Given the potential interaction of age and gender, and other earlier results (e.g. Figure 4), it was considered useful to test for the effect of this interaction in the model of school readiness. The results of this analysis are shown in Table 7:

Table 7: Model for Overall School Readiness with interaction terms (age by gender)

	Coefficient (b)	s.e.	t	P
(Constant)	-4.932	3.377	-1.460	0.148
Bilingual (Ref:No)	-0.912	0.422	-2.161	0.034
Gender (Ref:Girl)	11.319	4.645	2.437	0.017
Area (Ref:Rural)	1.502	0.270	5.566	<0.001
Age Days	0.003	0.002	1.664	0.100
Age*Gender (Interaction)	-0.006	0.002	-2.545	0.013

$$F(5, 85) = 12.397, p < 0.001, R^2 = 0.422 \text{ (Adjusted } R^2 = 0.388)$$

The above model explains 42.2% of the variance of the response variable ($R^2=0.422$). The ‘bilingual’ and ‘area’ coefficients can be interpreted in a similar way as for the model in Table 6. However, because of the introduction of the interaction term (Age by Gender) in the model, the coefficients for gender and age become meaningless for direct interpretation. What is of interest in this case is the significant (but low in magnitude) effect of their interaction. This is easier to visualize with the plot shown in Figure 5.

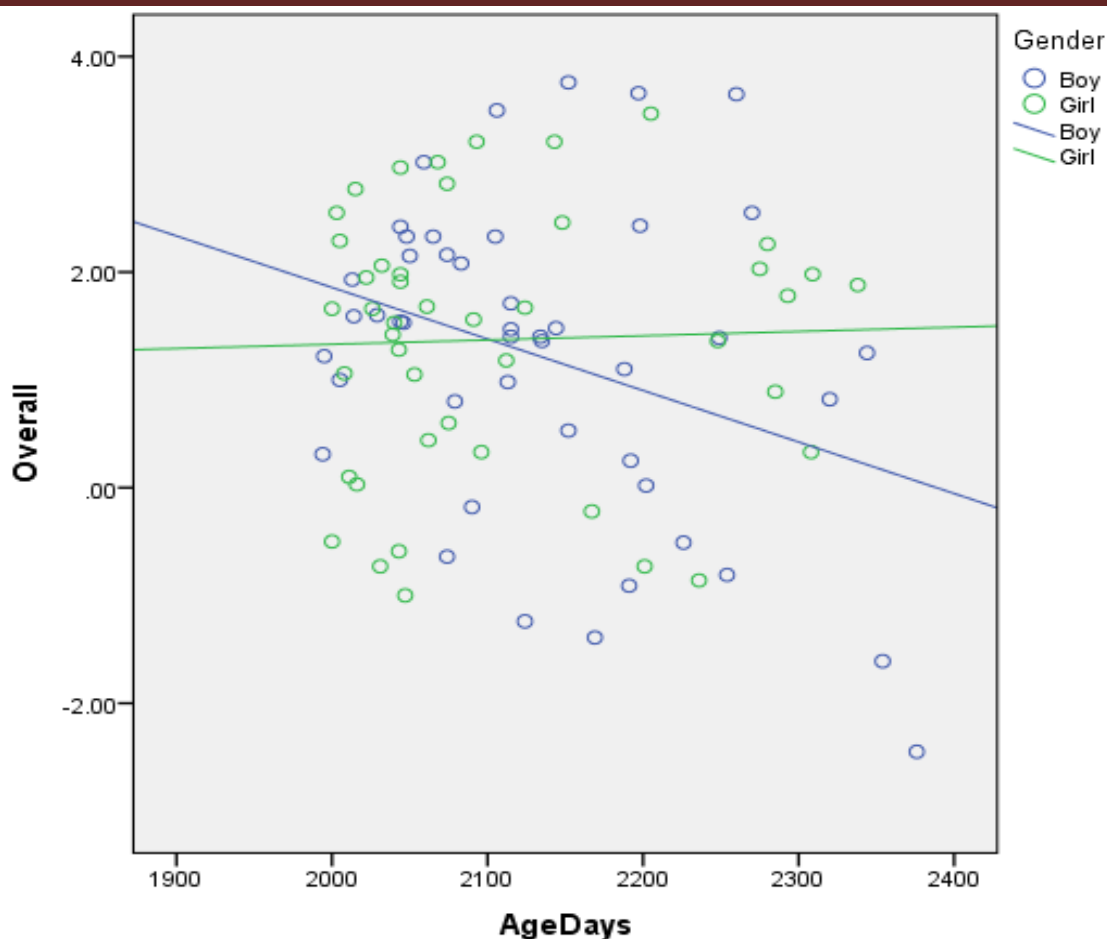


Figure 5: Interaction of children’s age and gender in response to their overall school readiness

As shown with Figure 5, younger boys tend to score higher than the same-aged girls; however this trend is reversed at about 2100 days (5.8 years): after this point girls start scoring higher with the difference to be increasing as children grow older.

Because of the significance of this interaction, for the overall score, it was decided to keep it in the regression models of the 4 sub-dimensions of developmental school readiness, summarized in Table 8. The focus of this presentation is to illustrate the effect of each of the variable of interest (e.g. area, bilingualism and gender by age interactions) after controlling for all other variables.

Table 8: Model for Overall School Readiness with interaction terms (age by gender)

Response:	Cognitive		Language		Motor		Emotional	
Fit statistics:								
R ² (adjusted R ²)	0.394 (0.358)		0.401 (0.365)		0.233 (0.188)		0.164 (0.115)	
F (p-value)	11.042 (<0.001)		11.364 (<0.001)		5.161 (<0.001)		3.329 (0.009)	
Variables	B-coef	t (p-value)	B-coef	t (p-value)	B-coef	t (p-value)	B-coef	t (p-value)
Constant	-3.98	-1.16 (0.25)	-3.14	-0.89(0.38)	-7.13	-1.7 (0.09)	0.35	.109 (0.913)
Bilingual (Ref:no)	-0.91	-2.12 (0.04)	-0.93	-2.11 (0.04)	0.07	0.13 (0.9)	-0.5	-1.24 (0.22)
Gender (Ref:G)	11.39	2.42 (0.02)	8.33	1.7 (0.09)	14.36	2.46 (0.02)	4.13	.949 (0.346)
Area (Ref:Ur)	1.39	5.07(<0.001)	1.53	5.42(<0.001)	1.2	3.5 (0.001)	0.65	2.57 (0.012)
Age (in days)	0.002	1.4 (0.17)	0.002	1.015 (0.3)	.004	1.84 (0.07)	-0.00	-.042 (0.97)
Age x Gender	-0.01	-2.5 (0.014)	-.004	-1.8 (0.07)	-.007	-2.6 (0.01)	-.002	-0.9 (0.33)

To sum up the results in Table8, it can be said that, the effect of the interaction of age and gender is significant in all models, except the one for emotional development. The area the children come from is significant for the modeling of all dimensions of school readiness, even after accounting for other variables, like bilingualism and gender. Finally, bilingualism is significantly important for the cognitive and language dimensions.

6. Discussion of Results

The purpose of this study was to establish a reliable screening test for school readiness for Greek Cypriot kindergarten children entering the primary school. This will enable for an easier transition to primary school and will be a useful tool to educators and parents to assist their children to this transition. Till today, there is no such tool available in Cyprus. Given the importance of early intervention, identification and remediation of language disorders and academic gaps (George Paraskevopoulos, Besevegis, Giannitsas, 1997) it is considered essential to develop a reliable and valid test which will measure academic achievement, indicate language disorders, and diagnose possible weakness in motor, emotional and social areas so as to prevent the negative outcomes of “at-risk-children” entering the primary school.

A summary of the achievement so far are presented with a discussion: Five robust measures of school readiness were constructed: one overall and four focused on particular skills (cognitive, language, physical/motor and emotional). Depending on the focus, they could each be used to inform decisions about the children’s academic progression or identification of areas to improve before or during first grade.

- Analysis with these measures also highlighted the following results:
 - o No age effects were found, but this could be due to sample specific characteristics (i.e. the interaction with gender);
 - o Children from rural areas scored lower in all dimensions of school readiness;
 - o Bilingual children scored lower in the cognitive and language dimension, as well as on the overall score of school readiness; however they did not appear having any deficiencies in their motor and emotional development.

The methodology follows the guidelines on ‘good measurement practice’ as others on the same topic used e.g. with the ECLS study (Hibel 2009; Pigott and Israel 2005). The chosen skills validated follow partly the instrument design and the sources of the items in the test. This led to the reported ‘dimensions’ or subscales of school readiness constructed and used here: cognitive, language, physical/motor and emotional. This distinction seems to accord with that based on the NEGP framework (Kagan et al. 1995) which proposes at least five necessary dimensions to define a child’s school readiness: physical health, social/emotional development, approaches to learning, language and cognitive development (Kagan et al. 1995; Hair et al. 2006; Halle et al. 2012; Kagan and Rigby 2003). It is also noted here that there is some preliminary evidence that this instrument can fit under the ECLS measurement framework under which school readiness is measured in three domains (reading/language skills, mathematics and general knowledge), as well as teacher evaluation of students’ learning approaches (Hibel 2009; Pigott and Israel 2005): in this case we had at least valid measures of mathematics, general knowledge (and linguistic skills), as well as the teacher’s evaluations.

There is a concern though regarding the predictive validity of this instrument, as this study is limited compared to others, because there is no evidence of the performance of these students later on their education. There is only some anecdotal evidence since the test has been used regularly every year constantly by a particular teacher/specialist during the last 10 years (at a private kindergarten school, Rainbow 2000-2010) and its results have been consistent. The results from the last 4 years (for which we draw on this paper) are very similar as they coincide with the general view of the teachers for those students, as discussed with them a year after (at the end of their first grade through a questionnaire). It is our intention to collect hard evidence for this during the next stage of the study.

The results of this analysis with the use of these measures also worth some further exploration. First, no significant relationship was found between children’s age and their school readiness scores. More interestingly, all the associations were negative, which seems to contradict existing findings. Data from key stage 1 and the General Certificate of Secondary Education (GCSE) assessments in UK, for example, confirm that older children in the year-group perform best, even though that study also reported some anomalies in the month on month trends. Such findings may be due to the differences in age when taking the tests, but may also be influenced by ‘age-position effects’ and entry policies (Sharp 1995). Age –related factors in the development of linguistic awareness were also reported in a recent study (Cunningham and Carroll 2011). The non-significance of the findings in respect to age, though, seem to agree more with earlier work of Wood and colleagues and the so-called ‘Gesell School Readiness Screening Test’: according to this study (Wood et al. 1984) the Gesell procedure was found to be effective in predicting child success or failure in Kindergarten but also within the range of 4 to 6 years the chronological age of children (entering Kindergarten) is unrelated to eventual success or failure during their pre-school education. Another related aspect, that could be causing this result, may have to do with the classroom age composition, and the inconclusive research on mixed-age classrooms (Bell et al. 2013).

Finally, results regarding the background variables, including social class and bilingual children are consistent with previous studies. The lower scores found for the rural group, for instance, is similar to the effects seen by others such as the effects of parental living situations and other socioeconomic factors reported by Kierman and colleagues (2008) or the parental involvement reported by Schaub (2013). The deficiencies demonstrated by the bilingual group are also consistent with findings regarding various minority and immigrant groups elsewhere (Hibel 2009; Riojas-Cortez and Bustos Flores 2009; Quirk et al. 2013).

The significance of these results should also be emphasized in regards to their impact and policy implications. Differences are important, whether coming from individuals or are sourced to broader social groups and phenomena. Rimm-Kaufman & Pianta (2000) for example focused their study on the set of individual skills and behaviors that children have acquired prior to school entry. Duncan et al. (2007) also refer to Meisels's work from 1998 who stated that a child's individual characteristics contribute to the environments in which the child interacts and the rate at which the child may learn new skills; in turn the child receives feedback from others in the environment. That was also evident in the recent study of Schaub (2013) who found that more educated parents participate more in cognitive activities with their young children. It seems then, influencing both the child and the social environment, early academic skills and socio-emotional behaviors are linked to academic achievement because they provide the foundation for positive classroom adaptation (Entwisle et al. 2005). Following this line of thought, Brown (2010) also makes some recommendations for policy makers and administrators in the sector in order to develop "a balanced vision of the readiness equation that takes into account not only children's academic skills and knowledge but also the capacity of the family, the school, and the community to prepare these children for school success" (p. 133).

It should be noted that analysis should be viewed as explanatory and illustrative of the usability and usefulness of this assessment tool, rather than inferential for the population. We aim to extend this work with further analysis with a more representative sample. The value of the work has also been recognized in respect to the Greek population, where we are currently piloting the test.

7. Conclusions

The results discussed above have serious policy implications, especially for Cyprus, for which a screening or diagnostic test for entry to primary school does not exist, as of yet. It is well acknowledged that parents/care givers and early childhood educators should have in-depth knowledge of the children in their care, based on their expertise, their understanding of each individual child's developmental milestones, their environment, and their personal experiences. On occasions, parents in partnership with the early childhood teacher, form a strong belief that a child is not quite ready for school - that his/her development in one or more of the developmental domains (social/emotional/physical/language/cognitive) has not yet reached sufficient maturity to be able to cope easily with school. Quite often, the decision is clear - the indicators are strong, and unambiguous - the preschooler would benefit from a further year in a preschool setting. However, there are times when a third opinion may be very helpful, and both parents and early childhood educators seek an external professional opinion to provide an objective viewpoint.

The main issue we need to deal with, and find ways to avoid is the so-called 'shock of A-grade' directly related with the transition from Pre-primary to Primary education (Dockett S. & Perry B., 2001). Going from Preschool to A' grade of Primary School is a stressful situation for most children and their parents. Furthermore, the National Curriculum does not take into account the child's different maturity level and developmental milestones so it adds upon this stressful situation. In addition, the enormous demands of the primary school regarding behavior and concentration increase the density of the problem.

This instrument presented here can be used to fill in this gap. Evidence of its validity as well as some preliminary findings have been shown here, and illustrate its potential impact in regards to gaining useful diagnostic information from these assessments for the students before or during their transition to primary school. These results, as discussed, are explanatory and mainly build on the constructed scores of school readiness. What has not been illustrated yet, but is part of the next steps of our analysis, is the definition of some 'cut-off' values with these scores to characterize 'non-readiness', as happens with some existing methods in the area (e.g. Hair et al. 2006; Halle et al. 2012).

Having mentioned that, the existing comprehensive, diagnostic use of the performance of the children on the test should not be underestimated: in addition to the overall scores, as well as those at different skills, the results are discussed with the teachers and parents in regards to the strong and weak points of each child. The parents are given a full descriptive profile with their child's performance in each area, highlighting the areas and issues they should be focusing on in order to more effectively assist them during their first year in Primary school. At the notification of an underperformance in most of the assessed areas, a suggestion can be made for either retention to preschool or provision of special support to assist the child to "catch up" and enable him/her to cope with the demands of the first year. Discussions with the teachers supported the reliability of these measures and predictions, since there is an agreement with the teachers' evaluations of the child's readiness.

Another important factor to consider and adapt to this screening/diagnostic tool is the immersing number of multilingual children in the school system and the differentiation in the distribution of the number of children Greek speaking/Bilingual Children in the classroom. As Cyprus is undergoing huge socio-economic changes and becoming more and more multicultural there is an increased need to address the needs of all students entering the primary school and have to follow the existing Greek National Curriculum which is rigid and non-flexible.

A fundamental next step will be the universal implementation of this diagnostic assessment tool as part of a central governmental effort. In essence, this implies persuading the Ministry of Education of Cyprus to adopt the national multidimensional definition of

school readiness so that the country can move forward in developing a state-wide plan for school readiness assessment. The evaluation of school readiness should be done at the end of the preschool year to provide a comprehensive picture of the child as a whole person. The diagnostic results should then be evaluated and used to offer any intervention needed to support the child. An efficient collaboration and communication between primary school and pre-school teachers is essential for the success of such efforts. Furthermore, it is immensely important to have parental awareness of the child's performance. Once all these parameters are in place, and the usage of the presented school-readiness tool is adequately administered and used, one can start talking about "a new vision" regarding School Readiness in Cyprus. A system, with its interdependent elements (i.e. child, family, school, environment, state), that will be able to support the successful transition of the child into the primary school system preventing unnecessary unpleasantness for the child, the family, the teacher and the school.

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