



Patterns of teacher-child relationships quality: Young children's perspectives

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ABSTRACT: Examining children's perspectives about the quality of teacher-child relationships can contribute significantly to our understanding of how the quality of these relationships is developed. The Child Appraisal of the Relationship with the Teacher Scale (CARTS) is a newly developed measure that assesses the quality of teacher-child relationships from children's perspectives. The purpose of this study was a) to confirm the factor structure of the Greek version of CARTS, b) to examine whether any patterns of teacher-child relationships exist, and c) if they are associated with children's gender and age. The sample consisted of 365 preschool children from Greece. Results confirmed the construct validity of the CARTS scale. Consistent with attachment-based research, results revealed four types of teacher-child relationships. In addition, results showed that patterns of teacher-child relationships based on children's perspectives, similar to those of teachers' perspectives, are existent from the early years.

Keywords: *teacher-child relationships, relationships patterns, children's perspectives, cluster analysis*

Introduction

Literature has provided ample evidence about the impact of teacher–child relationships on children’s cognitive, academic, and social-emotional development (Roorda, Verschueren, Vancraeyveldt, Van Craeyevelt, & Colpin, 2014; Spilt, Vervoort & Verschueren, 2017). A positive and supportive teacher–child relationship fosters school adjustment and classroom engagement (Howes, Fuligni, Hong, Huang & Lara-Cinisomo, 2013; Vitiello, Booren, Downer, & Williford, 2012), prosocial behavior (Roorda et al., 2014), language development, and math and reading achievement (Ly, Zhou, Chu, & Chen, 2012). Despite the importance of teacher–child relationships for children’s development, these relationships have been primarily studied in Western societies and less often in Eastern societies (Bear et al., 2014).

Furthermore, previous studies in early school years have provided evidence mainly based on teachers’ reports of teacher–child relationship quality (Gregoriadis & Tsigilis, 2008; Solheim, Berg-Nielsen, & Wichstrøm, 2012). Indeed, teachers’ perspectives have proven to be a valuable source of information over the past years, when examining quality of teacher-child relationships. However, utilizing both participants’ views regarding their relationship could offer a more in-depth insight on how these relationships develop and function. In early childhood education, only a handful of studies assessed young children’s perceptions of their teacher-child relationships (Mantzicopoulos, 2005; Spilt, Koomen & Mantzicopoulos, 2010; Vervoort, Doumen, & Verschueren 2015). This study contributes to these efforts by investigating the psychometric properties of a child-reported scale, namely CARTS (Vervoort et al., 2015). Also, it investigates the existence of teacher-child relationships patterns based on young children’s perceptions.

The perspective of attachment theory

Attachment theory (Bowlby, 1969; Ainsworth, 1969) provides a framework about the way close relationships function as a secure base for children. Drawing on attachment theory (Bowlby, 1969), researchers viewed teacher–child relationships as an extension of parent–child relationships. Modern literature describes five types of children’s attachment to teachers: a) secure, b) avoidant, c) resistant, d) disorganized and e) general (near secure) types of attachment (e.g. Bergin & Bergin, 2009; Granot, 2014b; Goldberg, Muir & Kerr, 1995). Children enter their school environment bringing together their mental representations of attachment relationships, based on their previous interpersonal experiences (O’Connor, 2010). These models of relationships influence the quality of early teacher-child relationships (Vervoot, Bosmans, Doumen, Minnis, & Verschueren, 2014). For example, when upset, children will show preference to their

attachment figure (Bergin & Bergin, 2009). Similar to their parents, attachment theorists suggest that children would regard their teachers as a safe haven, when they feel threatened. The quality of the teacher-child relationship, seen through the lenses of attachment theory, is conceptualized on three dimensions, closeness, conflict, and dependency (Verschueren & Koomen, 2012). Teacher's attachment behaviors like sensitivity, responsiveness, and attunement can improve the quality of a child's attachment to the attachment figure (Ainsworth, 1969).

Teacher-child relationships that are characterized by closeness, warm and open communication, offer to children the emotional security to explore the classroom environment (Pianta, 1999). Children who experience more conflictual relationships with their teachers may display increased behavior problems (Gallagher, Kainz, Vernon-Feagans & White, 2013) and develop negative school attitudes (Ly et al., 2012). On the other hand, dependent children lack autonomy and usually display some behavior problems (e.g. social withdrawal, hostile aggression with peers) (Murray & Greenberg, 2000). In short, closeness dimension is typically perceived as a positive relational trait, whereas conflict and dependency dimensions are viewed as negative relational traits (Spilt et al., 2017).

Measuring children's perspectives and relationships patterns

Measuring children's perspectives about their teacher-child relationships can be a challenging task. Studies show that children can provide reliable information for many aspects of their school life (e.g. Gregoriadis, Grammatikopoulos, Tsigilis & Verschueren, 2020; Mantzicopoulos & Neuharth-Pritchett, 2003; Vatou, 2020), when asked in a developmentally appropriate way. For example, children are considered able to respond to verbal questions using a binary or limited response scale (Ruzek, Jirout, Schenke, Vitiello, Whittaker, & Pianta, 2020). The inclusion of children's views about their relationship with their teachers, offers an alternative perspective that may be different from teachers' perspectives regarding their relationships with them and enhance our understanding of these relationships (Spilt et al., 2010).

However, there are only a few instruments available for measuring young children's perceptions of their relationship with their teachers (Hughes, 2011; Mantzicopoulos, 2005; Vervoort et al, 2015). These instruments that assess children's perceptions about relationships with their teachers are Relatedness Scales (Lynch & Cicchetti 1992), Young Children's Appraisals of Teacher Support (Y-CATS; Mantzicopoulos & Neuharth-Pritchett, 2003), Child-Report Student-Teacher Relationship Scale (Child-STRS; Koepke & Harkins, 2008), Network of Relationships Inventory (NRI; Hughes, 2011) and Child Appraisal of Relationship with Teacher Scale (CARTS; Vervoort et al., 2015). From these existing

measures, Child-STRS and CARTS are the only instruments that have been developed based on dimensions relevant to attachment theory and to the STRS (Koomen & Jellesma, 2015). The Child-STRS displayed a general agreement between teacher and children reports, but it had relatively low reliability scores (Koepke & Harkins, 2008).

CARTS is a self-report instrument created from the adaption of existing measures (e.g. STRS, Y-CATS) and assess children's perceptions about their relationship with teachers. (Vervoot et al., 2015). The CARTS scale comprises 16-items and measures the three dimensions of teacher-child relationship (Closness, Conflict and Dependency). Based on the findings of their pilot study, Doumen et al. (2009) describe CARTS as a measure appropriate for use in preschool-aged children. Furthermore, recent studies showed evidence for the reliability and validity of CARTS for both preschool and early elementary school children (Gregoriadis et al., 2020; Vervoort et al., 2015).

Researchers have demonstrated the importance of young children's perceptions in measuring the quality of teacher-child relationships (Gregoriadis et al., 2020; Mantzicopoulos & Neuharth-Pritchett, 2003). However, when it comes to relational patterns, only a few studies are based on children's perceptions (e.g. Murray & Greenberg, 2000; Wu, Hughes & Kwok, 2010). Furthermore, most of these studies that examined children's reports focused on elementary school students (Murray & Greenberg 2000; Wu et al., 2010). Few researchers have taken into account the perspective of young children when examining patterns of teacher-child relationship (Granot, 2014; Lynch & Cicchetti, 1997; Murray & Greenberg, 2000). Lynch and Cicchetti (1997) were among the first to develop a pattern grounded on the concepts of the child's psychological proximity seeking (engagement) and emotional quality (affect). Pianta (1994) examined teachers' perceptions about patterns of relationships between young children and teachers and concluded that membership was established through a five-cluster groups, namely 'optimal', 'average', 'disengaged', 'confused' and 'deprived'. In total, each cluster group included a combination of different levels of psychological proximity seeking and emotional quality. This five-group pattern was described only from the teachers' perspectives. Murray and Greenberg (2000) assessed elementary students' perceptions of their relationships with teachers and school bonding. They organized students into two groups according to perceptions of relationships with teachers and schooling bonds. They described four patterns: 'dysfunctional', 'functional/average', 'positively involved', and 'school anxious'. Also, the authors found similarity in teacher and student reports.

Wu et al. (2010) also reported an agreement between teachers' and student's reports and proposed a typology based on the stability of teacher-child relationship quality. Specifically, they identified four types of relationships (Congruent Positive, Congruent Negative, Incongruent Child Negative, and Incongruent Child Positive) based on teacher

and student reports of support and conflict, and peer reports of support. In another study in primary school, Granot (2014) by adopting both teachers' and children's perspectives, described two clusters of teacher-child relationships, namely 'secure attachment' and 'insecure attachment'. The first cluster demonstrated lower levels of emotional and behavioral problems, such as difficulties on academic and social adjustment. The second cluster captured relationships with high levels of rejection, conflict, and dependency. Finally, Gregoriadis and Grammatikopoulous (2014) identified four types of teacher-child relationships (C1 (dysfunctional), C2 (functional/average), C3 (high on the 'dependency' and 'closeness' and low on the 'conflict'), C4 (positively involved) – STRS groups) based on teachers' reports and three types of teacher-child relationships (C1 (optimal/positively), C2 functional-average/adequate), C3 (dysfunctional/disengaged)-CFATT groups) based on children's reports in kindergarten. Their findings were in agreement with other relevant studies with older children (Murray & Greenberg, 2000).

Identifying potential teacher-child relationship patterns, could help scholars develop methods to support children that do not experience school as a welcoming context (Murray & Greenberg, 2000). More research is needed in order to capture patterns of relationships (Verschueren & Koomen, 2012). A more in-depth understanding of patterns could help enhance children's overall school experience (Pianta, 1994).

Evidence about cultural influences on relationships

Previous studies that assessed teachers' perspectives on teacher-child relationships, using the STRS, have shown mixed findings regarding the influence of the cultural settings in the quality of teacher-child relationships and the way they are interpreted (Gregoriadis & Tsigilis, 2008; Koivula, Gregoriadis, Rautamies, & Grammatikopoulos, 2019; Solheim et al., 2012). For example, a series of Greek studies in early childhood education settings have shown that the dependency subscale is correlated positively with the closeness subscale (e.g. Gregoriadis & Tsigilis, 2008; Gregoriadis & Grammatikopoulos, 2014; Tsigilis, Gregoriadis & Grammatikopoulos, 2017; Tsigilis, Gregoriadis, Grammatikopoulos, & Zachopoulou, 2018). In contrast, Hamre and Pianta (2001) found that dependency and conflict subscales together represented generally negative relationship features.

With regard to the construct of dependency, the available research findings are somewhat contradictory. These contradictory findings could relate to the relatively low psychometric properties of the original STRS subscale for Dependency (Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012). Because of the contradictory results, the dependency subscale has occasionally been excluded from some empirical studies (e.g., Cadima, Doumen, Verschueren, & Leal, 2015). For example, Rydell, Bohlin and Thorell

(2005) decided to rule out the dependency subscale due to low internal consistency and a Swedish study confirmed the 28-item solution of STRS without reporting the statistics of a factor analysis (Drugli & Hjemdal, 2013).

The construct of dependency in teacher-child relationships seem to be interpreted differently in various sociocultural contexts (e.g. Gregoriadis & Tsigilis, 2008). Gregoriadis and Tsigilis (2008) mentioned that teachers' perceptions of dependency might be culturally dependent and more affected by the setting in which the teacher-child dyad functions. They argue that dependency can be seen as a positive relational quality in the context of more collectivistic cultures. Greek kindergarten teachers seem to consider dependency as a positive construct (Gregoriadis et al., 2020). This finding could show the cultural influence on the interpretation of teacher-child relationships and that a dependent behavior is more accepted in collectivistic cultures than in individualistic ones (Bornstein, 2005).

In addition, this significant positive association between Closeness and Dependency could perhaps be evident already from the first years of a child's life. Two recent studies found a moderate significant positive correlation among the constructs of closeness and dependency based on children's perspectives (e.g. Gregoriadis et al., 2020; Vervoot et al., 2015). Since these studies were conducted in two different contexts, a collectivistic and an individualistic one, their findings could also imply the influence of developmental issues (e.g. in a collectivistic setting, young children perceive dependency as a way to invest proximity with their teacher) in the formation of children's perceptions about their relationships (Vervoot et al., 2015).

Furthermore, children seem to interpret the construct of dependency in a similar positive way as the teachers do (Gregoriadis et al., 2020). This recurring finding in the Greek context showed that kindergarten teachers, in contrast with most of their colleagues in other Western countries, didn't consider dependent behaviors as a negative construct (Gregoriadis et al., 2020). On the contrary, individualistic societies regard highly of the value of autonomy and self-assertion (Solheim et al., 2012). Teachers in individualistic societies such as Norway and Finland set children's autonomy and independent exploration of environment as priority (Solheim et al., 2012; Koivula et al., 2019). They also interpret dependent behaviors as negative or inappropriate and therefore encourage children to be more independent and distance them from teacher's help in daily school life (Koivula et al., 2019).

Dependency is considered to be more culturally sensitive than closeness and conflict subscales (Tsigilis et al., 2017). Previous studies revealed mixed findings regarding the way the construct of dependency is perceived as a positive or a negative construct

(Solheim et al., 2012). On the basis of the above theoretical and empirical research, it is important for researchers to examine more systematically the construct of dependency (Tsigilis et al., 2017) and to investigate children's views about this notion as well.

Differences in relationship quality: child's gender and age

A large volume of studies examined the differences between teacher-child relationships and children's gender (Buyse, Verschueren, & Doumen, 2011; Choi & Dobbs-Oates, 2016; Mohamed, 2018). Differences regarding children's gender and teacher-child relationships could be attributed to the existing gender role stereotypes, that assume that girls are more socially oriented and tend to form more positive relationships with teachers (Maccoby, 2002). Girls are expected to behave responsibly and follow teacher's directions (Ewing & Taylor, 2009). According to gender stereotypes, teachers' expectations for children may hold a different reward system for boys and girls in line with these expectations (Ewing & Taylor, 2009). For example, teacher-child relationships tend to be more positive for girls than boys (Mohamed, 2018). Some studies note that girls tend to have teacher-child relationships characterized by warmth and closeness (Hamre & Pianta, 2001; Spilt et al. 2012). Spilt et al. (2012) investigated the impact of children's gender on the quality of teacher-child relationship, in a sample of 659 primary school teachers and 1,493 students (grades 1 to 6). The results of this study were consistent with the literature and showed that boys have more conflictual relationships with teachers than girls.

A research about teacher-child relationships and children's age has shown that as students get older their emotional closeness to teachers gradually decreases, especially when they move to high-school (Ang, Chong, Huan, Quek, & Yeo, 2008). Another study considered that the quality of the teacher-child relationship decreases during the first years of secondary education (Jellesma, Zee, & Koomen 2015). For example, younger children often rely more on their teachers and spend more time with them in the classroom, while older children may interact less with their teachers (Mejia & Hoglund, 2016). However, when it comes to teachers' reports of their mutual relationship over time the findings - and especially those related to the construct of conflict - seem less clear. Jerome, Hamre, and Pianta (2009) found a gradual increase in the dimension of conflict reported by teachers up to fifth grade and a slow decline in the mean of conflict after fifth grade. Contrary to the above findings, Koomen et al. (2012) showed that average levels of conflict from the view of teachers remain relatively stable throughout the primary school. Although a body of research have examined the impact of children's gender and age on relational quality, there is limited evidence on whether relationships differ across child's gender and age.

Purpose and research questions

The purpose of the current study is threefold: (a) The first is to confirm the factorial validity and reliability of the Greek version of the Child Appraisal of Relationship with Teacher Scale (CARTS), (b) the second is to investigate the patterns of teacher-child relationships based on children's perspectives, and (c) to examine whether there are differences among patterns of relationships and children's gender and age.

The study's research questions are:

- What is the factorial structure of the Greek version of the CARTS?
- What kind of patterns of relationships based on children's perspectives can be found?
- Are there differences between the patterns of relationships regarding children's gender and age?

We also hypothesized that (a) the three subscales of the CARTS will be revealed (e.g. Vervoot et al., 2015), (b) the cluster analysis using variables of the CARTS would show five patterns of teacher-child relationships based on attachment theory (e.g. Bergin & Bergin, 2009; Goldberg et al., 1995). Finally, we hypothesized that (c) relationships will differ regarding child's gender and age (e.g. Choi and Dobbs-Oates, 2016; Mejia & Hoglund, 2016). Specifically, we expected that older children would develop warmer and more supportive patterns of relationship than younger children. We also anticipated that boys would show more conflictual patterns of relationships with their teachers than girls.

Method

Participants

The Greek Early Childhood Education system consists of two sections. The first section refers to the childcare centers that include children aged 0–4 years and the second section refers to the kindergarten schools that include children aged 4–6 years. The basic difference between two sections is that kindergarten schools are obligatory by law and prepare children for the formal primary education (Gregoriadis, Tsigilis, Grammatikopoulos, & Kouli, 2015). Moreover, the teacher-child ratio in a typical classroom is one teacher per maximum 25 children (Koivula et al., 2019).

Thirty-four kindergarten schools from urban and suburban areas participated from three prefectures in Northern Greece (Thessaloniki, Pella, Halkidiki). Thirty-one classrooms were from public schools (N = 31) and 3 from private (N = 3). The sample consisted of 34

teachers and 365 preschool children. 189 children (51.8%) were girls and 176 (48.2%) were boys. Their age varied from 4.5 to 6 years ($M_{\text{age}} = 5.4$, $SD = .49$). More specifically, 34 kindergarten teachers provided demographic information for children about parent's occupation and children's ethnicity. Teachers' demographic variables were not obtained. As to children's ethnicity, 343 (94%) children were Greek and 22 (6%) foreign. All children understood and spoke the Greek language. Parents' occupation is presented in Table 1.

TABLE 1 Descriptive Statistics for Parents' Occupation

Occupation	Mother (N = 300)	Father (N = 291)
Public employee	17.7	16.2
Private employee	29.7	41.9
Freelance worker	10.3	23.7
Business	0.7	2.7
Trader	2	1.7
Farmer	2.7	8.2
Unemployed	4.3	4.5
Retired	-	1
Housekeeping	32.7	-
Percent %	100	100

Measures and Instruments

The Child Appraisal of Relationship with Teacher Scale (CARTS, Vervoort et al., 2015) was used to assess children's perceptions about their teacher-child relationships. The CARTS consists of 16 items measuring three dimensions of teacher-child relationships quality, Closeness (4 items, e.g., "*I have fun with my teacher*"), Conflict (7 items, e.g., "*My teacher often tells me that I do things wrong in class*"), and Dependency (5 items, e.g., "*I often ask my teacher whether I do things right*"). Vervoort et al. (2015) reported satisfactory internal consistency for the three subscales (Cronbach's alpha was .81, .89, .75 for Closeness, Conflict and Dependency respectively). Regarding the correlations among the CARTS factors, the Vervoort et al. (2015) study showed a negative correlation between the Conflict and Closeness factors, and a not significant correlation between the Conflict and Dependency factors. Also, a positive significant correlation between the Closeness and Dependency factors was found. The predictive and concurrent validity and the reliability of the CARTS have already been examined in previous studies (Gregoriadis et al., 2020; Vervoot et al., 2015).

The CARTS was initial developed in Dutch. To measure children's perceptions, the English version was translated into Greek by the second author with a back-translation

procedure. In the present study, the internal consistency of the Greek version of CARTS was good for Conflict (.77) and Dependency (.73) subscales and marginal for the Closeness subscale (.65).

Procedure

The Greek National Educational Policy Institute approved the research protocol and the ethics of the study. Before the study, the researchers informed the directors of preschools, the teachers and the parents about the study's aim and the overall research design. In addition, parents were asked to sign a consent form granting permission for their children to participate in the study. Children were also informed that their participation in the study was voluntary and that they could withdraw any time they felt like it.

The researchers visited the schools at the beginning of the day. The teacher of each classroom randomly selected six girls and six boys to take part in the study. Children with active parental permission were only included. In some cases, when a class had approximately 12 children, all children were selected in order to avoid any feeling of being left out.

Prior to the interview, researchers spent time with children in order to familiarize children with their presence. Then, the interview took place in an adjacent room. Children's responses were given in two steps. First, researchers read a given statement and asked children to (dis)confirm it (e.g. item 1 "*I have fun with my teacher. Is that correct for you? Yes or No?*"). Next, researchers asked them whether this statement was "always" or "sometimes" true (e.g. "*And is it always or sometimes like that?*") and then, children indicated verbally their responses. Researchers recorded children's verbally responses on a 5-point Likert-type scale from 1 (*always true*) to 5 (*sometimes true*). Moreover, teachers completed a questionnaire for each child that assessed demographic information such as age, ethnicity, and parent's occupation. The whole procedure for each child did not last more than 8-10 minutes.

Statistical analysis

A confirmatory factor analysis (CFA) was implemented to examine the psychometric properties of CARTS in the Greek sample. Based on the proposed structure of CARTS, a three factor model was postulated and tested. The model was fitted in Mplus 8, using the robust maximum likelihood estimator (MLM; Muthén & Muthén, 1998-2017).

Evaluation of the model's fit was based on various fit indices such as the χ^2 statistic, the Comparative Fit Index (CFI), Root-Mean-Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). A good/satisfactory fit model is

indicated by a non-significant χ^2 . CFI values of .90 to .95 suggest a good model fit, and RMSEA value smaller than 0.05 show very good fit (Geiser, 2013; Kline, 2015). Finally, SRMR values close to .06 are also indicative of a good fit (Kline, 2015).

Next, a cluster analysis was conducted to find an interpretable pattern of teacher-child relationships. Cluster analysis has been suggested as a useful and easy method for identifying patterns in a sample (Granot, 2014; Hair, Black, Babin & Anderson, 2014). The current study adopted first hierarchical cluster analysis followed by k-means analysis. This combination is appropriate for large samples and allows the switching of cluster membership (Hair et al., 2014).

The squared Euclidean distance was used to measure the (dis)similarity between pairs of objects. Ward's criterion (Ward, 1963) was selected to combine objects into clusters so that the overall within-cluster variance is minimized. Cluster analysis, as a totally descriptive method, is flexible regarding methodological presuppositions and assumptions (Coakes & Steed, 1999; Hair et al., 2014). The k-means algorithm is not based on distance measures such as Euclidean distance but uses the variance within a cluster as a measure to form similar clusters (Mooi & Sarstedt, 2011). Specifically, it "classifies a given data set through a certain number of clusters fixed a priori" (Grammatikopoulos & Gregoriadis, 2014, 393), therefore k-means does not build a hierarchy.

The final step of cluster analysis is the interpretation of the clusters. The derived clusters are conceptually distinguishable if clusters exhibit significantly different means. This could be ascertained by ANOVA; the corresponding R^2 coefficients were estimated by the application of a series of one-way ANOVAs. Finally, high R^2 values point out well divided clusters. Moreover, one-way ANOVAs were used in order to compare the clusters regarding children's gender and age. All the statistical analyses of second phase were performed with the SPSS v.25 statistical software.

Results

CARTS factor structure

The first purpose of the study was to understand the factor structure of the CARTS when it is applied to the Greek educational setting. Initially, CFA showed that two of the alternative fit indices did not suggest a satisfactory fit to the data ($\chi^2 = 997.57$, $df = 129$, $p < .001$, $CFI = .852$, $RMSEA = .059$, $SRMR = .074$). Inspection of sources that caused model ill fit showed that item 11 ("I like my teacher to be close when performing a task."), which designed to capture dependency, had low standardized loading (.231) and hence it was decided to discard it from further analysis. Moreover, modification indices suggested that the fit of the model could be further improved, if an error was introduced between items

Con 5 and Con 6. Both items capture the conflict dimension and express child's anger on teachers, whereas other items on this dimension capture the teacher's anger on children. Thus, an error covariance was added to the model. New CFA showed substantially improved fit of the model ($\chi^2 = 147.51$, $df = 86$, $p < .001$, $CFI = .924$, $RMSEA = .044$, $SRMR = .061$). The introduced error covariance was statistically significant, yielding a value of .24, which justifies our decision to include it into the model. All item loadings were statistically significant, ranging from .307 to .792 (Table 2).

TABLE 2 Confirmatory Factor Analysis Results on the Greek Version of the CARTS

CARTS Items	Factor 1 Closeness	Factor 2 Dependency	Factor 3 Conflict
Clo_1	.388		
Clo_3	.568		
Clo_13	.318		
Clo_15	.307		
Dep_2		.711	
Dep_4		.540	
Dep_7		.792	
Dep_16		.507	
Con_5			.560
Con_6			.520
Con_8			.613
Con_9			.579
Con_10			.492
Con_12			.610
Con_14			.625

Note: Loadings below .30 are not presented.

CARTS subscale intercorrelations

The subscales of the CARTS showed substantial inter-factor correlations in the expected directions. A Pearson correlation was applied to investigate the associations among the subscales. Conflict and Closeness were negatively related ($r = -.55$, $p < .001$), and Closeness and Dependency were positively related ($r = .32$, $p < .001$). Also, Dependency related significantly positively to Conflict ($r = .23$, $p < .001$). The descriptive statistics of the latent factors and their inter-factor correlations are presented in Table 3. Similar findings were found in previous studies based on adult's perceptions (Gregoriadis & Tsigilis, 2008; Tsigilis et al., 2017).

TABLE 3 Descriptive Statistics and Intercorrelation Matrix of the Three CARTS Subscales

	Overall	Correlations		
	<i>M (SD)</i>	1	2	3
1. Closeness	4.20 (.48)	-		
2. Dependency	3.60 (.90)	.32*	-	
3. Conflict	1.56 (.66)	-.55*	.23*	-

Note: * $p < .001$

Patterns based on children's perceptions

Cluster analysis was applied to examine the existence of patterns in children's perspectives about their teacher-child relationships. Visual inspection of a dendrogram was used to specify the number of clusters for the non-hierarchical cluster analysis. The appropriate cluster solution seems to be among 4 to 6 clusters. Then, a series of k-means, cluster analyses were conducted, and different solutions were implemented. The inspection of cluster analysis and the conceptual considerations indicated that a four-group solution was considered the most appropriate. The groups are described in Table 4. Also, the high R^2 values point out the validity of divided clusters.

TABLE 4 Group scores on CARTS factors for a four-group cluster solution

Factors	Clusters				R^2
	C1-CARTS- Secure Attachment	C2-CARTS- Functional/Average relationship	C3-CARTS- Ambivalent Attachment	C4-CARTS- General attachment	
Closeness	4.24	3.51	4.08	4.38	.87 *
Conflict	1.18	1.67	2.65	1.26	.77 *
Dependency	2.30	3.06	4.17	4.09	.76 *
Children	74 (20.3%)	52 (14.2%)	64 (17.5%)	175 (48%)	

Note: * $p < .001$

More specifically, the C1-CARTS cluster group referred to "secure attachment" and comprised 74 children. It was distinguished by very high scores on the "Closeness" (4.24) factor, moderate scores on the "Dependency" (2.30) factor and low scores on the "Conflict" (1.18) factor. The C2-CARTS cluster group consisted of 52 children and referred to "functional/average relationship". It was characterized from the moderate to high

scores on the “Closeness” (3.51) and “Dependency” (3.06) factors and on the “Conflict” (1.67) low scores. The C3-CARTS cluster group comprised 64 children and it was characterized from the high scores on the “Closeness” (4.08) and “Dependency” (4.17) and moderate scores on the “Conflict” (2.65) factor. Also, the C3-CARTS cluster group referred to “insecure-ambivalent attachment”. Finally, the C4-CARTS cluster group consisted of 175 children and it was described as “general attachment”. It was characterized by the high scores on the “Closeness” (4.38) and “Dependency” (4.09) factors and low scores on the “Conflict” (1.26). The majority of the children in the current study belonged to this cluster group (46.7%). The C3-CARTS and C4-CARTS clusters have nuanced differences between them.

Results from analysis of variance showed that the mean differences among each of cluster groups and dimensions of Closeness, Dependency and Conflict were significant, $F(3, 364) = 77.87, p < .001, \eta^2 = .039$, $F(3, 364) = 309.25, p < .001, \eta^2 = .072$ and $F(3, 364) = 258.99, p < .001, \eta^2 = .068$, respectively. Eta-squared (η^2), was used as an index of effect size. Each value ranging from medium to large (0.039 – .072). Moreover, the results indicated a no significant condition effect for clusters between C2-CARTS and C3-CARTS on Conflict dimension.

Finally, differences among the four cluster groups referring to children’s age (only for children aged 5.5 years through 6) were significant with regard to C2-CARTS ($F(3, 363) = 4.09, p < .05, \eta^2 = .033$) and to C3-CARTS ($F(3, 364) = 4.28, p < .05, \eta^2 = .034$). Post hoc analysis using Bonferroni test indicated that children showed higher levels on C2-CARTS and C3-CARTS at age 6 than at age 5.5 ($p < .006$ and $p < .003$, respectively). No significant differences were detected between cluster groups and children’s gender.

Discussion

The present study examined the underlying factor structure of CARTS proposed by Vervoort et al. (2015) and provided primarily evidence for the reliability and validity of the Greek version of CARTS. Application of CFA on the 15 items (item 11 was excluded), supported the three-dimensional structure of Closeness, Conflict and Dependency. This finding supports the original CARTS structure (Vervoort et al., 2015). The internal consistency of the Closeness was lower in comparison to the original study, while the internal consistency of the Conflict and Dependency were good (above of .70, Spector, 1992). An explanation of this finding could relate to the way that children perceive closeness and dependency. It is possible that children are finding it difficult to recognize the two constructs because of their age (Gregoriadis et al., 2020). In the initial Belgian study (Vervoot et al., 2015), the sample was conducted from primary schools and older

children could improve the reliability of their responses (Valeski & Stipek, 2001). In total, the results of psychometrics of the Greek version of the CARTS are acceptable as the fit indices met all the criteria of a satisfactory model (Geiser, 2013).

CARTS subscale mean indicates that overall young children describe their relationships with teachers as warm, supportive, and close with moderate to high levels of dependency and low levels of conflict. Also, the intercorrelations among the three factors of CARTS showed similar patterns of associations compared to previous studies (Gregoriadis et al., 2020; Vervoort et al., 2015). For example, in the original Belgian study of CARTS, dependency not only related positively with conflict, but also revealed a positive correlation with closeness (Vervoort et al., 2015). In the current study, the dependency subscale was significantly positively correlated with the closeness and conflict subscales.

The positive correlation of closeness and dependency is a finding that has been found systematically in previous studies in the Greek educational settings based on adult's perceptions (e.g., Gregoriadis & Tsigilis, 2008; Tsigilis et al., 2018). A similar positive correlation based on children's perceptions was first reported in the Gregoriadis et al. (2020) study. Taken together with our findings, it seems to empower the argument that children indeed do not perceive dependency as such a negative construct. In a culture described as collectivistic, the sense of dependency is close to feelings such as protection and proximity (Tsigilis et al., 2017). It could also mean that the influence of the cultural context in the interpretation of relational constructs, already existing in teachers, is formed at a much earlier stage of life in the preschool years. This finding also shows the need to gain a more in depth understanding of how the dependency construct is developed and how the cultural context is influencing teachers' and children's perspectives.

Another aim of the study was to investigate the existence of patterns of teacher-child relationships based on young children's perceptions. Findings from the cluster analysis revealed four possible types of relationships that match four types of attachment (C1-CARTS - "secure attachment", C2-CARTS - "functional/average relationship", C3-CARTS - "insecure-ambivalent attachment" and C4-CARTS - "general attachment") (Goldberg et al., 1995). Some of the findings of this study about the patterns are in agreement with those reported by other scholars (Grammatikopoulos & Gregoriadis, 2014; Lynch & Cicchetti, 1997; Pianta, 1994). In Pianta's (1994) study, the majority of children had a positive relationship with teachers (74%). Young children had developed a warm relationship with teacher which was characterized by open communication and low manifestations of anger. In our study, most of young children demonstrated high levels of closeness. These children reported positive and warm relations with teachers, and they also reported low manifestations of conflicts. These findings could mean that young children can develop

prosocial relationships relatively easily with their teachers. However, this finding is in contrast with findings from Murray's and Greenberg's study (2000), where many students reported low supportive relations with their teachers.

From the four identified patterns described in the current study, three of them (C1-C2-C3 CARTS) captured a similar structure with those of relevant studies (Lynch & Cicchetti, 1997; Murray & Greenberg, 2000; Pianta, 1994). Pianta's study (1994) showed that three of the clusters derived from teachers' reports had similar characteristics with those reported in the current study. The "Positively Involved" group and C1-CARTS (secure attachment) had low to moderate scores on the "conflict" and "dependency" factors, whereas on the "closeness" factor was very high. The "Functional/Average" group and C2-CARTS group had had moderate to average scores on all three. In addition, the "Dependent" cluster group and C3-CARTS (ambivalent attachment) showed very high scores for the "dependency" factor and moderate scores for the "conflict". In contrast with Pianta's study (1994), the results of the current study showed higher scores on the Closeness factor. This group of children with high levels of dependency is showing an increase in overreliance on the teacher as a source of support (Verschueren & Koomen, 2012).

The results about the C4-CARTS cluster group (general attachment) displayed high scores on the "closeness" and "dependency" factors respectively and low scores on the "conflict" factor. The existence of C4-CARTS group is related with the C3-STRS cluster group in Grammatikopoulos and Gregoriadis (2014) study, where scores were high on the "dependency" and "closeness" factors and low on the "conflict" factor. The Murray and Greenberg study (2000), did not report any similar findings based on children perspectives, but cluster groups with high levels of dependency are appearing for the second time in Greek educational context (i.e. C3-STRS; Gregoriadis & Grammatikopoulos, 2014). The existence of this cluster group had been reported only from the teachers' perspectives so far; thus, it is the first time that such a finding is found in children's perspectives. This finding could offer support to our earlier finding about the positive correlation between closeness and dependency. Perhaps children, under the influence of the cultural context, do not perceive dependency as a negative construct and are finding it difficult to tell apart among closeness and dependent behaviors.

Finally, the type of disorganized attachment is not present in our study. Previous studies have found small numbers of disorganized children in school age (Guidetti, Rabaglietti & Converso 2018; Murray & Greenberg, 2000). Children with disorganized attachment usually have interactions of moderate quality with their teachers (O'Connor & McCartney, 2006).

All tested comparisons among the four patterns of teacher-child relationships were statistically different across the three CARTS dimensions. The only exception was noted between C2-CARTS and C3-CARTS on the conflict dimension. Two possible explanations for this non-significant effect can be found in the literature. First, Roorda, Koomen, Spilt and Oort (2011) suggested that conflict is often seen as being student driven. Second, McGrath and Van Bergen (2015) noted that it is possible for a student to perceive his/her relationship with the teacher as positive, despite the actual level of conflict. It seems that students' low and moderate perceived levels of conflict with their teachers do not affect the sense of warmth and dependency.

The last aim of this study was to examine the differences among the patterns of relationships and children's gender and age. Contrary to expectations, gender differences were not found in this study. This finding is partial in disagreement with those reported by other studies (e.g., Choi & Dobbs-Oates, 2016; Vitiello et al., 2012). For example, Choi and Dobbs-Oates (2016) have found differences regard to child's gender when examining the potential predictors of teacher-child relationships. Prior teacher-reported studies focused on gender as the main predictor of teacher-child relationships quality (Buyse et al., 2011; Mohamed, 2018). Based on teachers' perceptions, researchers have reported that boys tend to form more conflictual and less closer relationships with their teachers than girls (e.g., Buyse et al., 2011; Koomen et al., 2012).

On the other part, children's age is related to C2-CARTS - "functional/average relationship" and C3-CARTS - "insecure-ambivalent attachment". Post hoc probing of this interaction indicated that the difference is detected only for children 5.5 through 6 years old. More specifically, older children reported higher levels on C2-CARTS and C3-CARTS patterns of relationships than younger ones. A positive teacher-child relationship such as C2-CARTS - "functional/average relationship" encourage older children to use their teacher as a secure base from which they can explore the classroom environment (Gregoriadis & Grammatikopoulos, 2014). This finding is in an agreement with teachers reports that rate older children as having better autonomy and engaged more positively with teachers than younger children (Vitiello et al., 2012). Furthermore, the interaction between C3-CARTS - "insecure-ambivalent attachment" and child's age indicated that another group of children aged 6 years reported more difficult patterns of relationships than younger children (e.g. dependent, conflict). Bosman, Roorda, van der Veen, and Koomen (2018) argued that differences in dependency become more visible as children grow older. Although, a dependent pattern of relationship was originally viewed as a relationship that is mainly relevant for young children, previous studies found that dependency could be also found it in elementary children (Roorda, Zee, & Koomen, 2020).

Limitations and future directions

Several limitations of the present study also point out directions for future research when interpreting the results. At first, we only used children reports to measure the quality of their relationships. Previous studies mention that both children's and teachers' views are a valuable source of information about teacher-child relationship (Gregoriadis et al., 2020; Spilt et al., 2010). Future studies might particularly involve both teachers' and children's perceptions for a more holistic examination of the dependency construct. In addition, the internal consistency of the closeness subscale is lower than .70. The low reliability of closeness could be connected to the complex nature of the construct (Koomen et al., 2012). Future applications of the CARTS in the Greek context are suggested to examine further its psychometric properties. A third limitation was that information about the possible influence of other variables on teacher-child relationship (e.g. teacher's experience, teachers' sensitivity, role of parent-attachment) was not examined. For example, teacher's sensitivity and behavioral responsiveness also contribute to the quality of teacher-child relationships (Doumen, Koomen, Buyse, Wouters, & Verschueren, 2012). Future studies should also examine teacher's demographic factors as well. A fourth limitation is the nature of data that are nested by teachers/classrooms. The application of multilevel analysis models would greatly contribute to the investigation of the independence of observable variables in future studies.

In preschool education, sources of knowledge about the quality or a good practice can function as guidance for the teachers (Moran et al., 2017). A wide range of professional development activities could provide teachers the tools, context and experiences to build new creative and responsive knowledge about their relationships with children. Assessing the quality of teacher-child relationship in a reliable and accurate way is vital, since a valid assessment could help researcher obtain an in-depth understanding of how it can enhance the quality of relationships. Such knowledge would in turn, facilitate the development of appropriate strategies for helping educators create more positive relationships with all children. In addition, school psychologists and educators could design and implement interventions for improving behaviors which lead to supportive and positive patterns of relationships (Thijs & Koomen, 2009). Finally, future research should focus on examining more systematically the construct of dependency in teacher-child relationships. For example, the CARTS dependency items refer to overreliance for help, whereas STRS dependency items refer to excessive help-seeking (Vervoort et al., 2015). A parallel examination of both STRS-Dependency and CARTS-Dependency items could offer to scholars the opportunity to investigate the whole range of dependency.

Conclusions

In this study, we confirm the factor structure of CARTS and support additional evidence for its reliability and validity. CARTS has been conceptualized from attachment theory (Verschueren & Koomen, 2012), including the dimensions of closeness, conflict and dependency. According to children's perceptions of these dimensions, they were divided into four patterns of relationships with their teachers. Parallel, the patterns reflect the attachment theory and developed through the children's experience on their relationship with teachers. On the contrary with previous studies (e.g. Pianta, 1999), the present study contributes to the literature by examining the patterns of relationships based on children's perceptions. In our study, the majority of children tend to have a general attachment with their teachers, which reflects on a 'dependent' pattern of relationship and captures high scores on dependency and closeness dimensions. This finding suggest that teachers perceive children's dependent behaviors as positive and allow them to exist in the classroom. In a collectivist society such as Greece, dependent behaviors are interpreted as a positive characteristic of relationship which is associated with the need of social acceptance from others. In this vein, patterns of relationships need to be compared with an individualistic country in order to explore cultural influences. Finally, our results suggested that the patterns of relationships and children's demographic characteristics is different across child age. This finding is reported at first time in Greek educational setting.

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