Parental and teachers attachment in children at risk of ADHD and with ADHD

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Abstract

Parents of children with Attention Deficit Hyperactivity Disorder (ADHD) experience more stress than parents of nonclinical controls. One of the factors that is highly significant in the study of parenting is attachment. Attachment has a quality that transcends the day-to-day interactions between parent and child. The style of attachment in children with ADHD was examined in this study. The main hypothesis is that ADHD children would be characterized by greater insecure attachment patterns than control children; secondly, it extends our current knowledge and attempts to understand if the pattern of insecure attachment developed with family caregivers would be present also with school caregivers. A sample of 72 children (36 young children aged 4-5 years: 12 at risk of ADHD-I, 12 at risk of ADHD-C and 12 controls; and 36 older children aged 7 years: 12 with ADHD-I, 12 with ADHD-C and 12 controls) was tested on both Family Separation Anxiety Test (F-SAT) and School Separation Anxiety Test (S-SAT) measures of attachment. Results showed that the ADHD-I and ADHD-C groups scored lower than controls on both SAT scales. There was also a strong positive correlation between the ADHD children's scores on the School and Family

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Separation Anxiety Tests. These findings suggest the attachment deficit may be an important but currently underestimated factor in the diagnosis of ADHD and that the family attachment patterns can predict the school attachment patterns.

1. Introduction

A substantial amount of literature exists documenting the cognitive, emotive and behavioural deficits present in Attention Deficit Hyperactivity Disorder (ADHD) (Pennington & Ozonoff, 1996; DuPaul & Heckert, 1997; Rothbart & Bates, 1998; Purdie, Hattie & Carroll, 2002; Gagliano, Lamberti, Siracusano, Ciuffo, Boncoddo, Maggio, *et al*., 2014; Fabio, Gullà, & Errante, 2015). However, studies differ in the emphasis placed on various aspects of the disorder. Due in part to these different perspectives, attempts to validate a unitary diagnosis of ADHD characterized by unique behavioural and neuropsychological functioning, neurochemical substrates or common psychiatric, psychosocial or neuropsychological outcomes have had limited success (Bonafina, Newcorn, McKay, Koda, & Halpherin, 2000). In this context, it has been proposed that the attachment theory may offer an important perspective on the development of ADHD (Stiefel, 1997; Erdman, 1998; Clarke, Ungerer, Chahoud, Johnson, & Stiefel, 2002). According to Bowlby's Attachment Theory, attachments develop from the need for security and safety that are acquired through life, and are usually directed towards a few specific individuals (Bowlby, 1969, 1988). The goal of attachment behaviour is to form and maintain an affectionate bond with a primary caregiver, usually the mother, throughout childhood and adulthood. This parent-infant interaction is referred to as "exploration from a secure base" (Ainsworth, Bell, & Stayton, 1974). The nature of the response given by the attachment figure, either positive or negative, is very important as the child encodes this information and incorporates into what is described as an internal working model. Whereas a positive interaction will lead to an internalized feeling of security (Bowlby, 1988; Crittenden, 1990; 2008), negative interaction will lead to insecurity and results in behavior that is avoidant, ambivalent or disorganized (Lyons-Ruth, 1996). An infant labelled "avoidant" generally gives the impression of being independent and self-sufficient; he differs from the securely attached child in that he seems unaffected by separation from their mother and either rejected or avoided her when she returned. Infants labelled "ambivalent" are more likely to cling to their mother in an unfamiliar environment and less willing to explore on their own; when separated from their mother they appear anxious, agitated and tearful (Ainsworth & Wittig, 1969). Finally, infants labelled "disorganized" (Main & Solomon, 1990) apparently lack a consistent strategy for organizing their comfort-seeking behaviour with the mother.

Their disorganized reactions include apprehension, helplessness and depression.

As above-mentioned, it is clear that early parent-child relationship serve as the foundation for the emergence of self-regulation skills that are strongly impaired in ADHD children.

Some support for the relationship between attachment impairment and ADHD comes from clinical studies (Cavallina, Pazzagli, Ghiglieri, & Mazzeschi, 2015). Pinto, Turton, Hughes, White and Gillberg (2006) find a link between scores for disorganized attachment at 1 year and later teacher-rated symptoms of ADHD. Also Green, Stanley and Peters (2007) obtained the same results with another tool. The authors investigated the relationship of child attachment representation, psychopathology, and maternal atypical parenting in a high-risk sample using the Manchester Child Attachment Story Task (MCAST). Disorganized attachment showed a high prevalence and independent associations with attention deficit symptomatology and maternal expressed emotions. In a longitudinal study Carlson, Jacobitz and Sroufe (1995) show that maternal intrusiveness assessed when infants were six months old was a more powerful predicted distractibility in early childhood, and hyperactivity in middle childhood, than did biological or temperament factors. Similarly Stiefel (1997) has linked the emergence of symptoms in ADHD to a lack of sustained parental attention during the child first year of life. Clarke and colleagues (2002) compared the quality of attachment in 5-10 years old boy with ADHD and a group of same-age normal controls. They used a broad based attachment assessment with three measures of representational models of attachment and the self: 1) the S.A.T. (Separation Anxiety Test) which assess children's verbal responses to hypothetical separation (Hansburg, 1972); 2) the self interview (Cassidy, 1988), which assesses children verbal descriptions of themselves in relation to significant others; 3) attachment-based rating of Family Drawings (Fury, 1996), which provide non-verbal assessment of the attachment relationship. Their results showed that children with ADHD were characterized by greater insecurity than control children. Specifically, the results suggest the presence of an anxious-ambivalent or disorganized attachment style in children with ADHD. Other evidence on the relationship between attachment impairment and ADHD comes from the striking similarities between the developmental outcomes of insecure attachment and the difficulties seen in children with ADHD (Erickson, Sroufe, & Egeland, 1985; Jacobson & Wille, 1986; Lyons-Ruth, Alpern, & Repacholi, 1993). Olson (1996) has reviewed the evidence regarding attachment anomalies and

over-activity. Insecurity of early mother-child attachment is related to teacher ratings of behavioural impulsivity and interpersonal hostility in pre-school age children.

Summarizing, the causes of ADHD are likely to stem from a combination of biological, often genetically determined neurochemical disturbances, and environmental disadvantages, and ADHD may be best conceptualized as a disorder of self-regulation, involving a generalized difficulty in the inhibition of cognitive, affective and motor functions (Olson, 1996; Barkley, 1997; Fabio & Urso, 2014; Fabio & Caprì, 2015; Fabio, Castriciano & Rondanini, 2015). These impairments in self-regulation may also have its roots in strained interactions with early caregivers and disrupted primary attachments (Olson, 1996; Sandberg & Barton, 1996; Stiefel, 1997). In this perspective the children with disrupted attachment have not learned how to regulate their negative arousal and their emotions, and so they are not able to self-regulate their behaviours and their cognitive processes. On the other hand, the security of the mother-child attachments has been shown to be related to a toddler's willingness to comply with the mother request and engage in positive and constructive problem solving. Secure mother-infant attachments have also been found to predict cognitive self-regulation and the ability to delay gratification at the time the child enters school (Olson, Roese, & Zanna, 1990).

The difficulty of ADHD to regulate their arousal continues throughout life in the formation of social relationships and the behaviour outside the family continues to reflect relationship expectation. Wiener and Daniels (2015) report that the same self-regulation deficit showed in a family setting, takes place in a school setting. The authors report on a qualitative study of the school experiences of adolescents with attention-deficit hyperactivity disorder (ADHD) in the context of quantitative research on teacher attitudes and practices, adolescent self-appraisals, and social and family relationships. The findings of the authors suggest that teachers of adolescents with ADHD in this case know about the nature of the disorder, understand that students' difficulties with organization and academic performance are not typically intentional, use evidence-based interventions to support students, and provide the monitoring and scaffolding needed for academic achievement. In the present study these qualitative results (Wiener & Daniels, 2015) are investigated with an instrument that is a semi-projective test developed to assess the representation of attachment in children, based on their responses to pictures of teacher-child separation experiences.

2. Aims and hypothesis

The purpose of the present investigation was twofold. Initially we sought to replicate and to confirm the results of Clarke *et al.*'s (2002) exploratory study, using two homogeneous age groups (one group of 4 to 5 year olds and one group of 7 years old). At a general level we aimed to support the findings of Clarke that ADHD children would be characterized by greater insecurity than control children. More specifically, we hypothesized that due to the high level of arousal and temperament in combined hyperactivity/impulsivity disorder (ADHD-C) children, they would show lower levels of self-reliance and attachment security than those with a predominantly inattentive type disorder (ADHD/I). The second and main aim is to extend our current knowledge on the relationship between attachment and ADHD and tries to understand if an insecure pattern of attachment with a family caregiver could be generalized to school caregivers.

3. Method

3.1. Participants

The participants in this study were selected from a database containing 600 children attending Kindergarten public schools (girls and boys aged 4-5 years) and 450 children attending primary public schools (girls and boys aged 7 years) in a district of Lombardy, Italy.

The final sample included 72 children, divided into two age groups. In the young age group there were 36 children aged 4-5 years: 12 at risk of ADHD-I (4 females, 8 males), 12 at risk of ADHD-C (1 females, 11 males) and 12 normally achieving controls (10 females, 2 males). In the older age group there were 36 children aged 7 years: 12 with ADHD-I (5 females, 7 males), 12 with ADHD-C (2 females, 10 males) and 12 normally achieving control, participants (3 females, 9 males). All the children lived with their biological parents. Two children with ADHD-HI were excluded from the study. The reason was the low representativeness of this subtype. A worldwide meta-analysis of 86 studies in children and adolescents and 11 studies in adults indicated that the predominantly hyperactive type of ADHD was the least common subtype in all samples (Willcutt, 2012).

3.1.1. Children at risk of ADHD

Children belonging to this group were diagnosed as children at risk of ADHD using an Italian version of the Praecox Deficit Attention Teacher Scale (PDATS, DuPaul, Power, Anastopoulos, & Reid, 1998), a teachers interview translated by Marcotto, Paltenghi and Cornoldi (2002). The PDATS corresponds to the symptom domain of ADHD as described in the DSM-V (American Psychiatric Association, 2013) with nine items belonging to the dimension of inattention and nine items to the dimension of hyperactivity-impulsivity. Items were rated on a 4-point scale (0 = never or rarely, 1 = sometimes, 2 = often, 3 = very often). The cut-off for the criterion score for inclusion of 32 (16 for the inattention dimension and 16 for the hyperactivity-impulsivity dimension) was taken from the standardized and validated version of the scale applied to kindergarten children by Marcotto and colleagues (2002). Children at risk of ADHD were defined as those with a positive rating of 2 or 3 on five or six items on either the inattention or hyperactive-impulsive subscales. Of the children at risk of ADHD, 12 met the DSM IV criteria for the inattentive subtype (ADHD-I) and 12 for the combined subtype (ADHD-C). Only 2 children with ADHD-HI subtype were excluded from further analysis.

To determine inclusion in the clinical groups, teachers were asked to complete Pelham's (1977) Disruptive Behaviour Disorder Rating Scale (DBDS; Italian translation by Marzocchi, Oosterlaan, De Meo, Di Pietro, Pizzica, & Cavolina, 2001). A specialized psychologist examined the children with high DBDS scores to determine those children that had a pervasive and chronic disorder (over 6 months of disorder). No child had any history of brain damage, epilepsy, psychosis or anxiety disorder. Of the 38 children selected as being "at risk of ADHD", 10 had to be excluded from the study either because no parental consent was forthcoming (n = 6), or because they scored an IQ of less than 85 on the Raven's Progressive Matrices (n = 4). Only 24 of the remaining 28 children were chosen.

3.1.2. Children with ADHD

As above, children in this group were diagnosed as ADHD using the Italian version of the PDATS (DuPaul *et al.*, 1998; Marcotto *et al.*, 2002) and analyzed by a specialized psychologist. Of this group, 12 met the DSM-5 criteria for the inattentive subtype (ADHD-I) and 12 met the criteria for the combined subtype (ADHD-C). Only 2 children with ADHD-HI subtype were excluded from further analysis. This diagnosis was confirmed using the Italian version of the DBDS (Marzocchi *et al.*, 2001), completed

by teachers. As before, the number of symptoms recorded in the DBD was used by the specialist psychologist to determine those children whose disorder was both pervasive and chronic (over 6 months of disorder). None of the children had any history of mental retardation, brain damage, epilepsy, psychosis or anxiety disorder. From the 31 children selected as ADHD, 7 were excluded either because no parental consent was forthcoming (n = 5), or because they scored an IQ of less than 85 on the Raven's Progressive Matrices (n = 2).

Table 1 - *Demographic characteristics of the groups*

	ADHD-I	ADHD-C	Controls	*df*	*F*	*p*
4-5 years old Children						
N of boys/girls	8/4	11/1	10/2			
Age in months *M* (*SD)*	54.10 (6.00)	56.00 (5.01)	58.00 (4.07)			
IQ *M* (*SD)*	98.20 (6.20)	102.00 (6.30)	104.00 (7.20)			
PDATS - hyperactivity *M* (*SD)*	5.10 (3.80)	18.80 (2.49)	2.00 (2.90)**	2.33	2.71	.01
PDATS - distractibility *M* (*SD)*	5.01 (2.50)	18.88 (3.14)	2.10 (2.4)**	2.33	2.81	.01
6-7 years old children						
N of boys/girls	7/5	10/2	9/3			
Age *M* (*SD)*	84.16 (7.02)	79.50 (5.20)	81.30 (7.02)			
IQ *M* (*SD)*	100.10 (6.70)	102.20 (7.10)	105.20 (4.60)			
DATS - distractibility *M* (*SD)*	17.16 (2.90)	18.28 (4.50)	7.60 (4.20)**	2.33	3.21	.01
DATS - hyperactivity *M* (*SD)*	7.19 (4.10)	19.83 (4.40)	3.70 (4.10)**	2.33	2.21	.01

** $p < .01$

3.1.3. Normally achieving control participants

These children were recruited from the same secondary schools and kindergarten as the two clinical groups and the four groups were matched for sex, IQ (Ravens Matrices) and age. Demographic and clinical characteristics of ADHD and control children are summarized in Table 1. The whole Raven's test was administered to estimate children's IQ. As expected, the ADHD and the control group differed significantly on DATS (distractibility subscale), $F(2,59) = 21.60$, $p < .001$ and on the DATS (hyperactivity subscale), $F(2,59) = 34.11$, $p < .001$. Least square difference post hoc analysis reveals that 4-5 years old ADHD-C children show higher PDATS scores than controls, both in distractibility and in hyperactivity subscale, respectively $t(21) = 3.21$, $p < .01$, $t(21) = 2.87$, $p < .01$ and ADHD-I children show higher PDATS scores than controls, only in distractibility subscale, $t(21) = 3.87$, $p < .01$. Least square difference post

hoc analysis reveals also that 6-7 years old ADHD-C children show higher PDATS scores than controls, both in distractibility and in hyperactivity subscale, respectively $t(23) = 4.22, p < .01, t(21) = 4.87, p < .01$ and ADHD-I children show higher PDATS scores than Controls, only in distractibility subscale, $t(21) = 4.81, p < .01$.

3.2. Procedure

For both clinical participants and controls, approval for study was obtained from the parents. They were also asked to complete PDAPS (Praecox Deficit Attention Parent Scale) and DAPS (Deficit Attention Parent Scale). These scales contain the same items of PDATS and DATS referred to family interaction. The correlations between PDAPS and PDATS and between DAPS and DATS were very high ($r = .81$). Each child was seen individually in a quiet room in either their kindergarten or primary school on three occasions (separated by approximately one week). Each session lasted approximately 30 minutes. Each child was administered the Raven test in one of the sessions and the two versions of SAT on two separate sessions. The order of administration of tests was counterbalanced across the three sessions.

3.3. Instruments

3.3.1. Family Separation Anxiety Test

This test, also used by Clarke *et al*. (2002), is a semi-projective test developed to assess the attachment representation of children based on their responses to pictures of parent-child separation experiences. In this study the Klagsbrun and Bowlby (1976) adaptation for 4-7 years olds was used. For each child the following scenes were presented, one at time:

1) Parents going out for the evening, leaving child at home;
2) A child's first day at school, at the point of separation from the mother;
3) Parents going away for the weekend, leaving the child with an aunt and uncle;
4) A child left in the park by his parents and told to play by alone;
5) Parents going away for 2 weeks, leaving a child at home;
6) A mother putting a child to bed and about to go out the door.

After each picture was described, the child was asked the following questions (as used in the standard administration of SAT): (1) How does the

child feel? (2) Why does the child feel (happy/sad)? (3) What is the child going to do? For clarification purposes, prompts were given when necessary. The scoring indices for the Seattle Version of SAT (Slough, Goyette, & Greenberg, 1988) were used, with responses allocated to one of 21 categories that were assigned weighted scores and combined to yield three factors:

1) Attachment: the child's ability to express vulnerability or need about severe separation, computed on a scale of 1 to 4, high scores indicate secure attachment themes;
2) Self-reliance: the child's ability to express self confidence about handling the mild separation, computed on a scale of 1 to 4, high scores indicate high ability to express self-reliance;
3) Avoidance: the child's degree of avoidance in discussing the separation, computed on a scale of 1 to 3, high scores indicate high levels of avoidance.

3.3.2. School Separation Anxiety Test

This test (Liverta Sempio & Marchetti, 1999; Liverta Sempio, Marchetti, & Lecciso, 1999) is a semi-projective test developed to assess the representation of attachment in children, based on their responses to pictures of teacher-child separation experiences. Each child was presented with a series of scenes, one at time. The test is structurally and semantically based on the Family Separation Anxiety Test (Clarke *et al.*, 2002) and uses the same procedure and scoring indices.

4. Results

The results are first discussed showing the Family Separation Anxiety Test and the School Separation Anxiety Test reliabilities, secondly the differences between the groups are presented and finally the correlations between the Family SAT and School SAT are showed.

4.1. Family and School SAT reliabilities

The principal investigator scored all verbatim transcripts anonymously. In order to establish inter-rater reliability, a sample (30% of the clinical and control transcripts) was also scored independently by an additional experienced rater. The index of inter-rater agreement (number of responses in each category type identified by the first rater/number of responses in

each category type identified by the second rater **x** 100) was high, 87% for the Attachment factor items, 91% for the Self-Reliance factor items and 89% for the Avoidance factor. Discrepancies between raters were resolved through negotiation and these revised criteria were used for rating subsequent transcripts.

Table 2 - *Between group comparisons on the Family and School Separation Anxiety Test*

	ADHD-I	ADHD-C	Controls	df	F	p
	M (SD)	M (SD)	M (SD)			
4-5 years old						
Family Separation Anxiety Test						
Global index	20.33 (11.44)	22.83 (8.45)	30.91 (3.36)	2.33	5.15	.01
Attachment	5.50 (3.03)	5.58 (2.86)	7.50 (2.67)	2.33	1.87	.17
Self-Reliant	8.16 (3.92)	9.08 (2.74)	11.75 (2.26)	2.33	4.38	.02
Avoidant	11. 33 (5.34)	9.83 (3.97)	6.33 (.65)	2.33	5.28	.01
6-7 years old						
Family Separation Anxiety Test						
Global index	26.25 (4.39)	27.55 (4.71)	30.08 (4.33)	2.33	4.59	.01
Attachment	7.25 (1.95)	6.91 (2.51)	9.08 (2.50)	2.33	3.58	.03
Self-Reliant	9.08 (1.44)	9.66 (.88)	9.91 (2.23)	2.33	1.92	.16
Avoidant	8.08 (2.46)	7.98 (2.06)	6.91 (1.71)	2.33	5.12	.01
4-5 years old						
School separation Anxiety Test						
Global index	19.50 (10.46)	19.66 (9.95)	29.00 (4.76)	2.33	3.58	.05
Attachment	5.41 (2.84)	5.00 (2.12)	7.83 (2.58)	2.33	3.52	.05
Self-Reliant	7.41 (3.37)	7.58 (3.31)	9.75 (3.01)	2.33	.83	.44
Avoidant	11.33 (5.06)	10.93 (4.44)	6.58 (1.72)	2.33	1.07	.35
6-7 years old						
School separation Anxiety Test						
Global index	25.83 (3.18)	25.00 (4.02)	29.75 (4.90)	2.33	4.59	.01
Attachment	6.58 (1.44)	5.91 (1.83)	8.58 (2.39)	2.33	6.21	.01
Self-Reliant	9.41 (0.99)	9.58 (1.31)	10.88 (2.10)	2.33	2.02	.15
Avoidant	9.16 (2.20)	8.50 (2.40)	7.00 (1.90)	2.33	0.72	.49

There were significant positive correlation between the Attachment and Self-Reliance scales for ADHD-I, ADHD-C and control group; $r(24) = .488$, $p = .017$; $r(24) = .42$, $p = .047$ and $r(24) = .37$, $p = .06$, respectively. However, the Avoidant scale was negatively correlated with the Attachment

and Self-Reliant scales for ADHD-I, ADHD-C and control group, $r(24) = -.72$, $p < .01$ and $r(24) = -.82$, $p < .01$; $r(24) = -.59$, $p < .01$ and $r(24) = -.69$, $p < .01$; $r(24) = -.41$, $p = .51$ and $r(24) = -.40$, $p = .053$, respectively.

The Attachment and Self-Reliance School scales were correlated for ADHD-I, ADHD-C and control group, $r(24) = .46$, $p = .02$, $r(24) = .61$, $p < .01$ and $r(24) = .36$, $p = .062$, respectively. The Avoidance scale was negatively correlated to Attachment and Self-Reliance scales for ADHD-I, ADHD-C and control group, $r(24) = -.78$, $p < .01$ and $r(24) = -.82$, $p < .01$; $r(24) = -.60$, $p < .01$ and $r(24) = -.86$, $p < .01$; $r(24) = -.41$, $p = .51$ and $r(24) = -.39$, $p = .055$, respectively.

4.2. Differences between the groups

Table 2 shows the means and standard deviations of the ADHD and control groups on each of the two attachment measures (Family SAT and School SAT). A 2 (ages: 4-5 years vs 6-7 years) x 3 (groups: ADHD-I vs ADHD-C vs Control) ANOVA was carried out. Significance was tested at the alpha level of .05.

4.2.1. Family Separation Anxiety Test

In the first ANOVA, with Family SAT as the dependent variable, age shows significant effect, $F(1,66) = 4.43$, $p = .03$, this means that the older children had a higher SAT score than the younger. There was also a significant main effect of group, $F(1,66) = 6.19$, $p = .003$. From table 2, we can see that both the ADHD-I and ADHD-C groups obtained poorer scores than the control group. This result was confirmed by post hoc analysis revealing significant differences between both the ADHD-I and ADHD-C groups and Controls ($t(24) = 6.58$, $p = .002$, $t(24) = 5.62$, $p = .007$ respectively) but no difference between the two clinical groups ($t(24)= .95$, $p = .64$). Further separate ANOVAs were applied with the three components of the family SAT, with reference to the attachment component, we found a significant effect of age, $F(1,66) = 6.37$, $p = .014$; the older group showed higher levels of attachment. Group had also a significant effect, $F(1,66) = 4.60$, $p = .013$; both the ADHD-I and ADHD-C groups obtained poorer scores than controls. Post hoc analysis confirmed that there were significant differences between the both the ADHD-I and the ADHD-C groups and controls ($t(24) = 1.91$, $p = .013$, $t(24) = 2.04$, $p = .009$ respectively) but no differences between the two clinical group ($t(24) = .12$,

$p = .87$). With reference to the self-reliance component, there was a significant main effects of group, $F(1,66) = 5.00$, $p = .009$. This result indicates that the ADHD-I and ADHD-C groups obtained poorer scores than controls. Post hoc analysis confirmed this, showing that there were significant differences between the ADHD-I and the ADHD-C groups and controls $t(24) = 2.20$, $p = .003$, $t(24) = 1.45$, $p = .044$ respectively) but no differences between the two clinical groups ($t(24) = .75$, $p = .29$). Finally, with reference to the avoidance component, there was a significant main effect of age, $F(1,66) = 4.33$, $p = .041$, the older group scored lower than the younger age group. There was also a significant main effect of group, $F(1,66) = 6.29$, $p = .003$. Post hoc analysis confirmed that there were significant differences between both the ADHD-I and the ADHD-C groups and controls ($t(24)= 3.08$, $p = .001$, $t(24)= 2.25$, $p = .015$ respectively) but no differences between the two clinical groups ($t(24) = .83$, p $= .35$).

4.2.2. School Separation Anxiety Test

With reference to school SAT performance we obtained a significant main effects of age, $F(1,66) = 6.56$, $p = .013$: the older group scored significantly higher than the younger group, and a significant effect of group, $F(1,66) = 8.07$, $p = .001$, such that both the ADHD-I and ADHD-C groups obtained poorer scores than controls. Post hoc analysis confirmed that there were significant differences between the ADHD-I and the ADHD-C groups and controls ($t(24) = 6.7$, $p = .001$, $t(24) = 7.04$, $p = .001$ respectively) but no differences between the two clinical groups ($t(24) = 1.9$, $p = .86$).The three sub-scales of SAT were separately analysed in three 2 x 3 ANOVA. In the attachment component, we found a significant main effect of group, $F(1,66) = 8.81$, $p = .0001$ suggesting that both the ADHD-I and ADHD-C groups scored more poorly than controls. Post hoc analysis confirmed this, revealing that there were significant differences between the ADHD-I and the ADHD-C groups and controls ($t(24) = 2.20$, $p = .002$, $t(24) = 2.75$, $p = .001$ respectively) but no differences between the two clinical groups ($t(24) = .69$, $p = .43$). There was no significant effect for age, $F(1,66) = 2.77$, $p = .10$. With reference to the self-reliance scale, we obtained a significant main effect of age, $F(1,66) = 7.22$, $p = .009$, with higher scores for the older age group. There was also a significant main effect of group, $F(1,66) = 3.46$, $p = .037$; both the ADHD-I and ADHD-C groups obtained poorer scores than controls. Post hoc analysis confirmed that there were significant differences between the ADHD-I and the ADHD-C groups and controls ($t(24) = 1.75$, $p = .02$, $t(24) = 1.58$, $p = .035$

respectively) but no differences between the two clinical groups (t(24) = .75, p = .82). Finally an analysis of avoidance component revealed a significant main effects of age, F(1,66) = 4.24, p = .043, such that the older children scored lower on this scale than the younger children. There was also a significant main effect of group, F(1,66) = 5.60, p = .006. Post hoc analysis confirmed that there were significant differences between the ADHD-I and the ADHD-C groups and controls *(t(24) = 2.75, p = .005, t(24) = 2.70, p = .005* respectively) but no differences between the two clinical groups (t(24) = .04, p = .96).

4.3. Correlation between School and Family Separation Anxiety Test

Scores on the School and Family versions of the Separation Anxiety Test were strongly correlated in all the groups, r(72) = .70, p < .001, suggesting that children with high levels of attachment security within the family also have a high level of attachment security at school. Moreover, this strong positive correlation between scores on the two tests was reflected in correlations between the sub-scales for attachment, r(72) = .68, p < .001; Self-reliance r(72) = .52, p < .001, and avoidance, r(72) = .64, p < .001.

5. Discussion

The findings of this study are consistent in their support of the hypothesis that ADHD is associated with an insecure internal working model of attachment (Erdman, 1998). As predicted, children with ADHD scored more poorly than controls on all the three scales of scholastic and parental versions of the SAT. Summarizing each result of the sub-scales, 1) Attachment: ADHD children expressed lower appropriate level of concern, fear, or feeling of sadness about severe separation than controls; 2) Self-reliance: ADHD children expressed lower self confidence and feeling of well-being about handling the mild separation than controls; 3) Avoidance: ADHD children expressed higher a degree of avoidance in discussing the separation than controls. In this sense, our findings replicate those of Clarke and colleagues (2002).

The second important finding is that the hyperactivity-impulsivity dimension does not appear to be determinant in the magnitude of insecurity. Factors such as temperament and arousal that have previously been shown to predict many aspects of children's development are not, on their own, powerful predictors of a insecurity pattern of behaviour. Rather as Sanson,

Oberklaid, Pedlow and Prior (1991) pointed out, they seem to have a significant impact only when other risk factors, such as poor parenting, economic hardship or difficulties of attachment are also present (Wiener & Daniels, 2015).

Data of the present study revealed a strong positive correlation between School Separation Anxiety Test and Family Separation Anxiety Test. According to Clarke *et al.* (2002) it was not clear whether the quality of care giving contributes directly to the development of ADHD related problems or if the child's challenging behaviours lead to disturbance in interactions. The new contribution coming from the present study is that children generalize from a pattern of attachment originating within the family context to other contexts such as the school environment. Moreover it supports the hypothesis that the difficulty of ADHD to regulate their arousal continues throughout life in the formation of social relationships and the behaviour outside the family continues to reflect relationship expectation.

In sum, we suggest that the symptoms of ADHD are the result of a complex mix of child, family and environmental influences, although the distinct contribution of each is not yet clear. Arousal, temperament and behaviour are three of the childhood factors that have been linked to later social competence and wellbeing and it is reasonable to suggest that similar factors may be seen involved in the vulnerability to attachment problems. Ladnier and Massanari (1999) propose a cycle to explain the way in which the relationship between child and caregiver can lead to ADHD. The cycle begins when the child is expects a strong negative emotion such as anger, sadness, loneliness, or fear. Lacking the capacity for self-control, the child attempts to relate with the caregiver through intrusive, demanding, attention-seeking behaviours. The caregiver begins to feel irritation and resentment and responds with criticism or physical violence (hitting). The child then reacts by attempting to ignore the caregiver and becomes defiant or coercive and raises the level of his acting-out behaviours. This leads to an increase in the level of conflict by the parents and so the cycle is perpetuated. The same pattern of escalating conflict is re-enacted at school where children with ADHD are often punished for their behaviour.

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