# A correlational study on attachment dimensions, academic performance and self-regulated learning of university students in South Africa

Bianca Lee Thomas (neé Negrao)[a,b], Margaretha Viljoen[b]

[a]Department of Human Anatomy and Physiology, University of Johannesburg, Johannesburg, South Africa

[b]Department of Psychiatry, University of Pretoria, Pretoria, South Africa

**Corresponding author:**

Bianca Lee Thomas

Private Bag X2

Suite 149

Dunswart

1508

South Africa

Tel: +27 11 559 6250

Fax: +27 11 559 6558

E-mail: bthomas@uj.ac.za

ORCiD: orcid.org/0000-0001-9476-4041

**Abstract**

An association between attachment and academic performance appears to be consistently found in children; however, reports on such an association in adolescents are contradictory. This study aimed to determine whether the attachment dimensions of anxiety or avoidance significantly correlate with a student's academic performance at university. Moreover, since individual differences in attachment index distinct self-regulatory capacities, this study aimed to determine whether any correlation exists between a student's attachment dimensions and measures of self-regulated learning. Attachment dimensions were determined by the Experiences in Close Relationships-Revised questionnaire, while self-regulated learning was determined by the Learning and Study Strategies Inventory, in a sample of university students (n = 185). Neither attachment dimensions correlated significantly with measures of academic performance. However, attachment dimensions did significantly correlate with measures of self-regulated learning in this study.

**Keywords:** attachment dimensions; attachment avoidance; attachment anxiety; academic performance; self-regulated learning, tertiary education

## Introduction

Bowlby conceptualized the term *attachment system* as an evolved behavioural system designed to regulate an infants' proximity to their primary caregiver and thereby increase their chances of survival in the face of external threats (Bowlby, 1958). The attachment system is therefore activated when an infant perceives danger or experiences distress, and results in an attempt to gain proximity to the attachment figure (Diamond, 2001). This proximity serves to soothe the infant, allowing them to continue exploration. Some infants, however, fail to derive consistent distress-alleviation from their attachment figure and therefore develop an insecure pattern of attachment (Diamond, 2001). In essence, caregivers who are available, responsive and sensitive to an infant's emotional and physical needs tend to establish patterns of secure attachment; while those who provide chaotic, unpredictable, rejecting or neglectful care, or who consistently provide non-contingent responses to the infant, promote the development of an insecure pattern of attachment (Swain, Lorberbaum, Kose, & Strathearn, 2007). Attachment can be conceptualized in terms of a continuous variation along two independent dimensions of anxiety and avoidance (Diamond, 2001; Diamond & Hicks, 2005). Attachment anxiety is a measure of the fear of loss, care-seeking and perceived dependency on the attachment figure; while attachment avoidance measures deactivation of attachment signals, distrust of intimacy and preference for autonomy (Maunder, Lancee, Nolan, Hunter, & Tannenbaum, 2006). In other words, attachment anxiety describes the degree to which an individual prefers close contact with the attachment figure and depends on that contact for reassurance and security, while attachment avoidance represents the degree to which an individual requires independence and interpersonal distance (Maunder, Panzer, et al., 2006).

The prefrontal cortex (PFC) is responsible for what is known as the executive functioning of the brain. Executive functions can be classified as those functions that are called into action

when the task demands are non-routine, such as during planning, working memory, response control and attentional shifting (Hansen, Johnsen, & Thayer, 2003). Interestingly, the prefrontal cortex shows the most prolonged postnatal development; characterized by an overproduction of synapses, followed by a protracted period of gradual pruning (Bernier, Beauchamp, Carlson, & Lalonde, 2015). Therefore, substantial opportunity exists for early environmental input to impact on the development of prefrontal brain structures and thereby influence the executive functioning of the brain. It is therefore believed that an individual's attachment style is able to influence more than one's ability to form social bonds, since it has the ability to modify the brain's sensitivity to threat and stress, as well as the body's capacity for managing stress-related metabolic demands and recovering from stress (Diamond, Hicks, & Otter-Henderson, 2006; Maunder, Lancee, et al., 2006). In support of this view, early social and emotional deprivation has been shown to be associated with both structural and functional changes in the orbitofrontal gyrus, infralimbic prefrontal cortex, amygdala, hippocampus head and left uncinate fasciculus (Porges & Furman, 2011). Furthermore, early experiences also appear to have the ability to alter a number of physiological and behavioural functions that include cognition, affect and self-image (Hofer, 2006; Mikulincer, 1998). In terms of executive functioning, it is believed that securely attached individuals that have acquired inner working models in which the caregiver is available to help if necessary, need to devote fewer cognitive resources to monitoring the caregiver's availability during exploration. These freed up resources or *security of exploration* can be invested in competent exploration, providing a safe environment in which children can learn to master the self-regulated thought and action that defines executive functioning (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012).

### *Attachment and executive functioning*

Executive functioning is believed to be crucial for academic success since it underlies many of the abilities required for successful management of a learning environment. These include the ability to strategically focus and disengage attention as needed, maintain concentration, resist interference in class or during social exchanges, learn from one's academic or interpersonal errors, and control the urge to react to social provocation inappropriately (Bernier et al., 2015). It is therefore believed that individuals who have a secure pattern of attachment have more emotional, cognitive and behavioural resources available to them to invest in academic success (Bernier, Larose, Boivin, & Soucy, 2004). The ability to engage in cognitively sophisticated explorations follows from the notion of confident expectations of both the self, favouring development of motivation and confidence, and others, that a secure level of attachment affords (Jacobsen, Edelstein, & Hofmann, 1994).

#### *Early childhood*

A study has shown that kindergarteners (ages five to six, n = 105) who were more securely attached to their mothers in toddlerhood (as assessed at 15 months and two years of age) showed better performance on tasks of executive functioning and displayed fewer problems of executive functioning (as rated by their teachers) in everyday school situations (Bernier et al., 2015). These results held even after controlling for socioeconomic status, age, gender and general cognitive functioning (Bernier et al., 2015). Similarly, attachment security between one and two years of age was significantly related to executive function tasks requiring strong working memory and cognitive flexibility components at age three years and above (n = 62) (Bernier et al., 2012). Recent research has even shown that higher quality mother-infant interactions predict increased electroencephalogram power at frontal locations (n = 215

infants), which itself predicts performance in tasks that involve executive functioning (Bernier, Calkins, & Bell, 2016).

*Middle childhood*

As for early childhood, indications suggest that attachment style may influence executive functioning in middle childhood. In support of this, a study on six-year-old mother-child dyads (n = 40) showed that maternal attachment is significantly associated with executive cognitive functions, with maternal tutoring accounting for some of this association (von der Lippe, Eilertsen, Hartmann, & Killen, 2010). In a study on school-age children (n = 108) by Moss and St-Laurent (2001), secure children, as assessed at six years of age, were shown to display a higher level of cognitive engagement during mother-child joint problem solving, as well as greater mastery motivation when tested two years later. Mastery motivation is an indication of an individual's learning strategies, with high mastery goal scores indicating a preference for more challenging tasks and greater self-regulatory abilities (Moss & St-Laurent, 2001). Similarly, a longitudinal study on Icelandic children (n = 85) found that children who had secure attachments at age seven were advantaged in their later cognitive performances (at ages nine, 12, 15 and 17) as gauged by their scores on a battery of tasks assessing both concrete and formal operational reasoning (Jacobsen et al., 1994). Importantly, the results of the latter study held even after intelligence quotient (IQ) and attention difficulties were controlled for (Jacobsen et al., 1994).

*Adolescence*

Although scarcely studied in older participants, it appears that the influence of attachment on executive functioning extends into adolescence. Indeed, a study on 40 adolescents between the ages of 11 and 16 years of age has shown that insecure attachment is associated with poorer

performance on tests of executive functioning, such as measures of attention, processing speed, visuospatial ability and cognitive flexibility (Escobar et al., 2013).

### *Attachment and academic performance*

*Middle childhood*

Secure attachment at 24 or 36 months of age has been shown to be related to better academic performance (as determined by school grades) in middle childhood in a large cohort of students (n = 1253) (K. K. West, Mathews, & Kerns, 2013). Similarly, attachment to father has been shown to significantly predict grade point average (GPA) in language mastery in a cohort of French children (n = 122) of eight to 12 years, even after controlling for gender, age, and cognitive performance (Bacro, 2011). This relationship was shown to be mediated by academic self-concept, suggesting that attachment security may encourage children to perform so that they preserve their positive representations of themselves (Bacro, 2011). Similarly, Aviezer, Sagi, Resnick, and Gini (2002) showed that infant attachment to mother was strongly associated with teacher ratings of academic performance in a group (n = 66) of young Israeli children (mean age 11 years). Moreover, a longitudinal study on children (n = 108) similarly indicated that secure attachment, as determined at age seven, was associated with better attention and participation in school and higher GPAs throughout childhood, even after social class, gender, IQ, perspective-taking ability and prior behaviour in childhood were controlled for (Jacobsen & Hofmann, 1997). In the latter study, the association between attachment and GPA appeared to be partially mediated by attention-participation in school and, interestingly, children that displayed secure attachment in this study were shown to exhibit higher mean IQ scores than those that were classified as insecure (Jacobsen & Hofmann, 1997). Similarly, a study on children in fourth grade (n = 376) found that GPA, as assessed by averaged grades from language, mathematics, science and social science, was negatively associated with

insecurity of attachment (Hortaçsu, 1994). This association was suggested to be due to differential relationships of insecure children with their teachers (Hortaçsu, 1994). In support of these findings, the previously mentioned study by Jacobsen et al. (1994) also showed that children that were classified as secure at age seven obtained significantly higher grades throughout school than insecure groups.

However, it is crucial to note here that not all studies have consistently showed a significant positive association between attachment and academic performance, with some studies showing no association between secure attachment and the achievement of academic success in middle childhood (Granot & Mayseless, 2001; Moss & St-Laurent, 2001).

*Adolescence*

The finding of an association between attachment and academic performance in younger children appears to have been replicated in adolescents; however with inconsistent results. In a study on academic performance during the college transition by Larose, Bernier, & Tarabulsy (2005), students with high attachment avoidance achieved lower academic performance than securely attached students, as indicated by the standardized general mean for their college marks, even after controlling for high school academic performance. This effect appeared to be mediated by the quality of attention paid in class (Larose et al., 2005). Suggested explanations for these results by the authors are that students with high attachment avoidance might avoid the challenge of college and therefore invest few interpersonal resources into the academic experience (Larose et al., 2005). Similarly, they suggested that students with high attachment anxiety may become overwhelmed with the social and emotional demands of the college transition and therefore fail to meet the academic demands (Larose et al., 2005).

However, there are studies on adolescents that have failed to find any effect of attachment on academic performance (Bernier et al., 2004; Burdick, 2014; Duchesne & Larose, 2007).

### *Attachment and self-regulated learning*

The relationship with one's caregiver can be described as formative since it is believed to facilitate the development of the brain's major self-regulatory mechanisms and therefore lay the foundation for all self-regulatory abilities (Panzer & Viljoen, 2004; Schore & Schore, 2008). The caregiver is believed to provide cues that regulate the biological and behavioural state of the infant and therefore foster the development of both coping and social response behaviours (Hill-Soderlund et al., 2008). Over time, external regulation by the caregiver is translated into internal self-regulation, enabling these regulatory skills to be generalized across time and context (Carleton & Padolsky, 2012; Drake, Belsky, & Fearon, 2014). Individual differences in attachment are therefore believed to index distinct capacities and strategies for self-regulation (Diamond, 2001). In other words, the attachment system is believed to modulate both emotional and physiological reactivity to both internal and external stimuli, in order for individuals to respond appropriately to demands (Diamond, 2001) and is considered to be essential for effective coping, problem solving, social functioning and overall physical and mental health (Diamond & Hicks, 2005). It has therefore been suggested that difficulties in self-regulation share an etiological base with attachment system dysfunction (Padykula & Conklin, 2010) and that trauma disrupts the link between infant and caregiver, resulting in a poorly developed self-regulatory system (Carleton & Padolsky, 2012). In line with this thought, studies have indeed shown a significant positive association between secure attachment and greater self-regulatory skills (measured in a variety of ways) from infancy (Kochanska, Philibert, & Barry, 2009; Matas, Arend, & Sroufe, 1978) and childhood (Birmingham, Bub, & Vaughn, 2017; Drake et al., 2014; Fearon & Belsky, 2004), through to

adolescence (Blalock, Franzese, Machell, & Strauman, 2015; Zeinali, Sharifi, Enayati, Asgari, & Pasha, 2011).

## Aim

This study aimed to, firstly, determine whether the attachment dimensions of anxiety or avoidance can significantly predict a student's academic performance in the first year of university and, secondly, whether any correlation exists between a student's attachment dimensions and measures of self-regulated learning at the tertiary level of education.

## Materials and Methods

### *Sample*

The study protocol was approved by the University of Johannesburg's Faculty of Health Sciences Research Ethics Committee (approval number AEC01-31-2014), as well as the University of Pretoria's Faculty of Health Sciences Research Ethics Committee (339/2014), and was conducted in accordance with the Declaration of Helsinki guidelines. The sample comprised of one hundred and eighty five first year students in the Faculty of Health Sciences at the University of Johannesburg. The mean age of the sample was 20.07 years (SD = 2.68). The sample was predominantly female (n = 126/185; 68%). Ethnicity distribution was as follows: Black (n = 121/185; 65%); White (n = 38/185; 21%); Indian (n = 23/185; 12%); Coloured (n = 3/185; 2%). Informed consent was obtained from all participants and consent to process personal information (i.e. academic results) of the students was obtained in order to comply with the Protection of Personal Information Act of South Africa, 2013.

### *Attachment dimensions*

Psychological attachment dimensions of anxiety and avoidance were determined by means of the experiences in close relationships-revised (ECR-R) questionnaire (Fraley, Waller, & Brennan, 2000). This questionnaire requires participants to think about their close relationships, without focusing on a specific partner, and rate the appropriateness of each item on a seven-point Likert-type scale (one = disagree strongly; seven = agree strongly). Although there is currently no gold standard self-report measure of adult attachment, the ECR-R has been shown to have good reliability and validity (Diamond & Hicks, 2005) and ECR-R measured attachment is relatively stable and unresponsive to changes in disease state (Maunder, Panzer, et al., 2006). Furthermore, test information (a measure of the extent to which the scale is informative or discriminates across the full range of the underlying trait) is greater in the ECR-R than any other attachment self-report instrument (Maunder, Lancee, et al., 2006). This questionnaire has previously been used in a study on the South African population, with the prevalence of a secure style (30%) resembling the prevalence of security in American undergraduate students (30%) (Maunder, Panzer, et al., 2006).

### *Self-regulated learning*

Self-regulated learning was determined by the online version of the LASSI, 2nd edition from H&H Publishing (Clearwater, Florida). The LASSI is a 10-subscale, 80-item, assessment of students' awareness and use of learning and study strategies related to Skill, Will and Self-regulatory components of strategic learning. A brief description of each of the subscales is included below:

1. Anxiety: this subscale measures students' feelings of worry or concern with regards to their academic performance

2. Concentration: this subscale measures students' ability to maintain attention and focus on their learning
3. Motivation: this subscale measures students' desire and willingness to work hard
4. Selecting Main Ideas: this subscale measures students' ability to determine the critical points and key ideas in the learning material
5. Time Management: this subscale measures students' ability to plan and exercise conscious control over the amount of time spent on learning
6. Information processing: this subscale measures students' use of verbal and imaginational elaboration, strategies of organising and interrelating information, and skills of comprehending, reasoning and logic in their learning
7. Self-Testing: this subscale measures students' ability to test their comprehension regarding a specific aspect of learning
8. Study Aids: this subscale measures students' use of aids and techniques to support their learning
9. Attitude: this subscale measures students' interest in their academic performance and their desire to perform well academically
10. Test Strategies: this subscale measures students' knowledge of different types of test strategies and necessary preparation required for tests

The Skill component of strategic learning is assessed by the subscales of Information Processing, Selecting Main Ideas, and Test Strategies, and assesses students' ability to use different cognitive strategies effectively in their learning (Yip, 2012). The Will component of strategic learning is assessed by the subscales of Attitude, Motivation, and Anxiety, and assesses students' self-efficacy, ability to maintain motivation, and ability to sustain a positive attitude towards their learning (Yip, 2012). The Self-regulation component is

assessed by the subscales of Concentration, Time Management, Self-Testing, and Study Aids, and assesses students' self-regulated skills (Yip, 2012). Alpha reliabilities range from 0.73 to 0.89 for the respective scales (Weinstein & Palmer, 2002) and the test-retest correlation is 0.88 for the total instrument (C. West, Kurz, Smith, & Graham, 2014). Evaluations of the LASSI have determined that this questionnaire is useful in the South African context as a diagnostic tool (Agar & Knopfmacher, 1995), with norms for South African students closely resembling the norms of the American population (Van Aardt & Van Wyk, 1991).

Participants were asked to rate the degree to which each statement was perceived as typical of them using a five-point Likert-type scale, with five representing the highest ("very much typical of me") degree of agreement. Negatively worded items were reverse scored. Since there are 10 LASSI subscales, with eight items each, the possible score for each subscale ranged from a minimum of eight to a maximum of 40 points. A higher score indicated greater possession of the trait associated with the subscale, with the exception of the Anxiety subscale, which is reverse scored. Since the online version of the LASSI was utilized in this study, individual scores for each of the subscales were automatically converted to percentile score equivalents, based on national normative data. Percentile score equivalents on the individual LASSI subscales were then used to calculate the Skill, Will and Self-regulatory components of strategic learning.

***Academic performance***

Academic performance was determined by means of a standardized general mean of all marks attained by the student in a common core of classes required for graduation, with failed or dropped courses receiving a score of 50. Academic performance within a specific module (Anatomy and Physiology) was also determined, in order to establish whether academic

performance within a specific module would show the same relationship to attachment dimension scores as that of overall academic performance. A measure of prior academic performance, calculated based on the University of Johannesburg admissions point score (APS) system, was included in this study in order to determine the relationship between prior academic performance and attachment dimensions. The APS system allocates point values to the levels of achievement obtained for a student's matriculation subjects.

***Statistical analysis***

One-way analyses of variance (ANOVAs) were used to determine whether attachment dimension scores differed as a function of the demographic variables of gender and ethnicity. Spearman rank-order correlations were run to assess the relationship between attachment dimension scores and age. Correlations between attachment dimension scores and academic performance measures were determined using Spearman rank-order correlation coefficients. Correlations between attachment dimension scores and LASSI variables were similarly determined using Spearman rank-order correlation coefficients. A $p$ value $< 0.05$ was considered significant for all statistical analyses.

**Results**

Descriptive statistics for academic performance measures and attachment dimension scores are indicated in Table 1. Means and standard deviations for the attachment dimensions measured in our sample closely resemble published norms based on a sample of over 22 000 people (78% female) with an average age of 24 (SD=10) (Fraley et al., 2000). One-way ANOVA indicated that neither attachment anxiety ($F(3,181) = 1.06$, $p = 0.369$), nor attachment avoidance ($F(3,181) = 1.79$, $p = 0.152$) differed as a function of ethnicity. Similarly, neither attachment anxiety ($F(1,183) = 0.07$, $p = 0.786$), nor attachment avoidance ($F(1,183) = 2.14$, $p = 0.146$)

were shown, by one-way ANOVA, to differ as a function of gender. Moreover, Spearman rank-order correlation analysis indicated that neither attachment anxiety ($r_s(183) = 0.014$; $p = 0.853$) nor attachment avoidance ($r_s(183) = -0.078$; $p = 0.292$) correlated significantly with age.

**Table 1.** Descriptive statistics for academic performance and attachment dimension scores

| **Parameter** | **Mean** | **SD** | **95% CI** |
|---|---|---|---|
| Admission point score (n=185) | 38.24 | 6.69 | (37.22; 39.26) |
| Standardized general mean (%) (n=185) | 66.11 | 8.89 | (64.82; 67.40) |
| Anatomy and Physiology marks (%) (n=185) | 63.72 | 15.02 | (61.55; 65.90) |
| Attachment anxiety (n=185) | 3.18 | 1.11 | (3.02; 3.34) |
| Attachment avoidance (n=185) | 3.36 | 1.09 | (3.20; 3.52) |

***Correlations between attachment dimensions and academic performance***

Correlations between attachment dimensions and academic performance scores are indicated by Spearman rank-order correlation coefficients in Table 2. Neither attachment anxiety, nor attachment avoidance, correlated significantly with any of the measures of academic performance.

**Table 2.** Spearman rank-order correlation coefficients for attachment dimensions and academic performance scores

| **Spearman's correlation between** | **Attachment anxiety** | | **Attachment avoidance** | |
|---|---|---|---|---|
| | ***$r_s(183)$*** | ***p* value** | ***$r_s(183)$*** | ***p* value** |
| Admission point scores | -0.06 | 0.469 | -0.01 | 0.895 |
| Standardized general mean (%) | -0.08 | 0.263 | -0.07 | 0.315 |
| Anatomy and Physiology marks (%) | -0.07 | 0.340 | -0.09 | 0.231 |

***Correlations between attachment dimensions and self-regulated learning***

Correlations between attachment dimensions and LASSI variables are indicated by Spearman rank-order correlation coefficients in Table 3. Attachment anxiety showed statistically significant negative correlations with all of the LASSI subscales and components. Attachment avoidance showed statistically significant negative correlations with all of the LASSI components and almost all of the LASSI subscales, with the exception of the subscale of Self-Testing.

**Table 3**. Spearman rank-order correlation coefficients for attachment dimensions and LASSI variables

| | **Spearman's correlation between** | **Attachment anxiety** | | **Attachment avoidance** | |
|---|---|---|---|---|---|
| | | ***$r_s$(183)*** | ***p* value** | ***$r_s$(183)*** | ***p* value** |
| **LASSI subscales** | Anxiety | -0.25 | <0.001[b] | -0.19 | 0.015[a] |
| | Attitude | -0.29 | <0.001[b] | -0.18 | 0.018[a] |
| | Concentration | -0.39 | <0.001[b] | -0.33 | <0.001[b] |
| | Information Processing | -0.20 | 0.008[b] | -0.15 | 0.048[a] |
| | Motivation | -0.24 | 0.001[b] | -0.22 | 0.004[b] |
| | Self-Testing | -0.21 | 0.006[b] | -0.13 | 0.091 |
| | Selecting Main Ideas | -0.28 | <0.001[b] | -0.19 | 0.012[a] |
| | Study Aids | -0.19 | 0.01[a] | -0.21 | 0.005[b] |
| | Time Management | -0.28 | <0.001[b] | -0.21 | 0.005[b] |
| | Test Strategies | -0.32 | <0.001[b] | -0.26 | <0.001[b] |
| **LASSI components** | Skill | -0.34 | <0.001[b] | -0.22 | 0.003[b] |
| | Will | -0.33 | <0.001[b] | -0.25 | 0.001[b] |
| | Self-Regulation | -0.34 | <0.001[b] | -0.28 | <0.001[b] |

[a] $p < 0.05$

[b] $p < 0.01$

## Discussion

Although associations between attachment patterns and academic performance have almost consistently been found in early and middle childhood, results in adolescence are inconsistent, with some finding an association between the two (Larose et al., 2005) and others failing to find any relationship between attachment and academic performance (Bernier et al., 2004; Burdick, 2014; Duchesne & Larose, 2007). The results of this study support the findings by Bernier et al. (2004), Duchesne and Larose (2007) and Burdick (2014) that no association exists between attachment and academic performance scores in adolescence. Duchesne and Larose (2007) suggested that attachment may be more related to the subjective aspects of school adjustment, such as a student's ability to make friends and develop positive relationships with their teachers. In support of this Bernier et al. (2004) found a significant effect of attachment on adjustment to college and, although not associated with absolute grades, attachment was able to predict deterioration of students' academic performance from high school to college. These authors therefore suggested that preoccupation with attachment might act as a risk factor for the deterioration of academic performance when a student faces social challenges. In order to test this hypothesis in the present study, the average of each student's matriculation marks and first year university marks were calculated and the difference between the two determined. Students marks were shown to deteriorate from high school to university (M = -3.10%, SD = 10.31); however the attachment dimensions of anxiety ($r_s(183)$ = -0.049; $p$ =0.535) and avoidance ($r_s(183)$ = 0.028; $p$ = 0.727) were not shown to correlate significantly with this mark deterioration. Therefore the suggestion of Bernier et al. (2004) was not supported by the results of this study.

Possible reasons for the lack of a significant association between attachment and academic performance in the present study are suggested based on relevant theories of how attachment

may influence academic performance. However, further studies are needed to prove or disprove these suggestions. The *attachment-teaching hypothesis* suggests that secure attachment relationships afford the caregiver the opportunity to better teach their children, who are less distracted by task-irrelevant, attachment-related aspects of the learning situation (van Ijzendoorn, Dijkstra, & Bus, 1995). At the university level, however, we can comfortably assume that, in the vast majority of student-caregiver relationships, caregivers are no longer teaching their children. Therefore, the ability of securely attached children to learn well from their caregivers would no longer significantly influence their academic performance. Although it is assumed that the relationship could be extrapolated to the teacher-student association, this does not seem to be the case. This is evidenced by the fact that a link between attachment and academic performance has commonly been found in studies on younger subjects (as discussed in the introduction), while results from studies on adolescents and university students are inconsistent, with a number of studies, including the present study, finding no association between the two. The *attachment-exploration hypothesis* suggests that secure individuals can more confidently derive insights and skills from the exploration of new environments, while insecurely attached individuals would be more focussed on attachment-related characteristics of the environment (van Ijzendoorn et al., 1995). Since exploration is believed to be the cradle of curiosity, learning and cognitive development, this would adversely impact on the ability of insecurely attached individuals to learn (von der Lippe et al., 2010). However, our study suggests that the unwillingness to explore that insecurely attached individuals might exhibit does not appear to negatively impact on their learning to the extent that their academic performance suffers. A possible explanation for this might be the fact that at university, a large component of learning is autonomous or independent and happens in a students' own time, at home or within another environment in which they are comfortable and which does not require environmental exploration. Moreover, interactions between lecturers and university students,

as well as between university students themselves, may not be as intense or invasive as the interactions between teachers and students, and students themselves, at primary and high school. This less intrusive quality of the interactions in a lecture hall might allow a university student to explore without interference from attachment-related characteristics associated with the environment. The *attachment-cooperation hypothesis* suggests that securely attached children are more willing to comply with the demands of school since separation from their caregiver does not induce the anxiety and stress apparent in insecurely attached individuals, which could undermine their ability to benefit from schooling (K. K. West et al., 2013). It is safe to assume that since students in university have spent at least 12 years in the schooling system, they are more used to being separated from their caregivers for a typical school day. Therefore, the stress and anxiety that this separation would have produced during early school years is no longer as prevalent at the tertiary level of education. The *social-network hypothesis* highlights the central role of relationships with peers and non-parental caregivers such as teachers in cognitive development, and suggests that insecurely attached individuals might be too defensive or too ambivalent to use these resources optimally (van Ijzendoorn et al., 1995). Securely attached children may, it is suggested, be more comfortable expressing their knowledge, or lack thereof, which may lead to better understanding of concepts and ultimately academic success (K. K. West et al., 2013). At university, however, a large component of learning depends on students mastering the work themselves. Therefore, although an insecurely attached student might not optimally benefit from positive relationships with peers and lecturers, they may still be able to learn well on their own, and, as a result, their academic performance may not suffer to the same extent that it would at a younger age. The *self-regulation hypothesis* (K. K. West et al., 2013) suggests that a student's internal working model of attachment may stimulate or delay cognitive development due to its influence on self-motivation and self-control (van Ijzendoorn et al., 1995). In other words, repeated experiences

of successful regulation by a competent caregiver allow securely attached children to internalize and gradually integrate the skills being taught into their own repertoire of self-motivation and self-control (Bernier et al., 2015). This hypothesis leads one to assume that, since a securely attached student develops a better self-regulatory profile, they are able to perform well academically. However, as evidenced by findings in our laboratory, it would then be self-regulation, and not attachment, that would show a statistically significant relationship with academic performance.

***Attachment and self-regulated learning***

Results of the present study are in line with the concept defined by the *self-regulation hypothesis*, which suggests that a student's attachment dimensions have the ability to influence their self-regulatory skills. Statistically significant negative correlations were found between attachment anxiety and all measures of self-regulated learning. Similarly, statistically significant negative correlations were found between attachment avoidance and most measures of self-regulated learning, with the exception of the subscales of Self-Testing. The results of this study therefore support previous findings of a significant association between a secure level of attachment and greater self-regulatory skills in adolescence (Blalock et al., 2015; Zeinali et al., 2011). Although these associations are moderate, this is to be expected based on the multi-faceted nature of self-regulated learning. Some of the aspects believed to be involved in the development of self-regulated learning include a student's personal theory of self-competence, the cognitive strategies available to that student, the student's motivation, as well as their social cognition in the classroom, to name a few (Zimmerman, 1990). The association between attachment and self-regulation is virtually self-explanatory. Since a secure attachment system promotes behavioural and biological synchrony between the caregiver and the infant, it is believed to result in the creation of a bio-behavioural system that promotes and supports

the development of the infant's own regulatory systems (Hill-Soderlund et al., 2008). Therefore, secure attachment allows a person to maintain a calm, coherent and confident state of mind while dealing with threats and challenges, and allows the individual to devote cognitive resources to important projects and tasks. This type of self-regulatory ability is effective in executing personal plans and life responsibilities (Zeinali et al., 2011). Infants who receive sensitive and responsive external regulation from their caregivers are believed to successfully internalize the ability to self-regulate, manifested in adaptive cognitive and behavioural coping strategies and more positive emotions (Diamond et al., 2006). Insecurely attached individuals, on the other hand, have difficulty with self-regulation and do not seem to be able to effectively learn regulatory skills from other sources (Diamond, 2001). It would be of interest in future studies, with less diverse student populations, to test whether these effects remain after controlling for intelligence.

This study suggests that, of the two attachment dimensions, attachment anxiety is more strongly associated with poor self-regulated learning. This has not been tested in previous studies, which classified participants into those with secure versus insecure patterns of attachment, as opposed to measuring their respective attachment dimension scores. However, when analysed further, the finding of a stronger relationship between attachment anxiety (versus attachment avoidance) and self-regulated learning does appear to hold true, as self-regulatory abilities naturally involve a high degree of independence or autonomy. As previously mentioned, attachment anxiety describes the degree to which an individual prefers close contact with the attachment figure and depends on that contact for reassurance and security, while attachment avoidance represents the degree to which an individual requires independence and interpersonal distance (Maunder, Panzer, et al., 2006). It therefore intuitively makes sense that an individual that strongly depends on an attachment figure for

reassurance and security would struggle to learn how to monitor and control their own behaviour, emotions and thoughts. Since they are ultimately always seeking approval and reassurance from their attachment figure, they would be less able to learn to internalize the regulatory skills needed to perform autonomously. On the other hand, an individual high in attachment avoidance that prefers independence would be able to perform autonomously, however they may struggle to learn self-regulatory skills from their caregiver and/or others. Therefore, although an individual high in this attachment dimension would still struggle to self-regulate, the effect of high levels of attachment avoidance on self-regulatory learning abilities would not be as detrimental as that of high levels of attachment anxiety. In view of the associations found between attachment dimensions and self-regulated learning and the link between self-regulated learning and academic performance, it is feasible to suspect that, should resources allow, secure attachment priming could thereby improve academic performance. Secure attachment priming has indeed been shown to be of benefit across diverse behaviours, with especially strong effects among anxiously attached individuals (Gillath & Karantzas, 2018). Moreover, research has also indicated positive results from interventions designed to improve students' self-regulatory learning skills (Schunk, 2005). These interventions have been shown to be derived and maintained from relatively short interventions, transfer beyond the training context, and generalize over time (Schunk, 2005). Since associations between self-regulated learning and academic performance have been found, both in our laboratory and that of others (Alkhateeb & Nasser, 2014; Cavero, 2012; Ning & Downing, 2010; Schutz, Gallagher, & Tepe, 2011; Seabi, 2011; C. West et al., 2014; C. West & Sadoski, 2011; Yip, 2012), this study supports previous suggestions that improvements in a students' self-regulated learning abilities may ultimately result in improved academic performance.

## Conclusions

Attachment dimensions do not appear to be significant predictors of a student's academic performance at the tertiary level of education. However, attachment dimensions are significantly associated with measures of self-regulated learning in university students. It is thus feasible to suggest that attachment dimensions could influence academic performance indirectly through their effects on self-regulated learning.

## Acknowledgements

The authors would like to thank Professor Piet Becker for his assistance in the statistical analysis of the study.

## References

Agar, D. L., & Knopfmacher, N. (1995). The Learning and Study Strategies Inventory: A South African Application. *Higher Education, 30*(1), 115–126. https://doi.org/10.1007/BF01384056

Alkhateeb, H. M., & Nasser, R. (2014). Assessment of learning and study strategies of university students in Qatar using an Arabic translation of the Learning and Study Strategies Inventory. *Psychological Reports, 114*(3), 947–965. https://doi.org/10.2466/11.03.PR0.114k26w3

Aviezer, O., Sagi, A., Resnick, G., & Gini, M. (2002). School competence in young adolescence: Links to early attachment relationships beyond concurrent self-perceived competence and representations of relationships. *International Journal of Behavioral Development, 26*(5), 397–409. https://doi.org/10.1080/01650250143000328

Bacro, F. (2011). Perceived Attachment Security to Father, Academic Self-Concept and School Performance in Language Mastery. *Journal of Child and Family Studies*, *21*(6), 992–1002. https://doi.org/10.1007/s10826-011-9561-1

Bernier, A., Beauchamp, M. H., Carlson, S. M., & Lalonde, G. (2015). A secure base from which to regulate: Attachment security in toddlerhood as a predictor of executive functioning at school entry. *Developmental Psychology*, *51*(9), 1177–1189. https://doi.org/10.1037/dev0000032

Bernier, A., Calkins, S. D., & Bell, M. A. (2016). Longitudinal Associations Between the Quality of Mother-Infant Interactions and Brain Development Across Infancy. *Child Development*, *87*(4), 1159–1174. https://doi.org/10.1111/cdev.12518

Bernier, A., Carlson, S. M., Deschênes, M., & Matte-Gagné, C. (2012). Social factors in the development of early executive functioning: a closer look at the caregiving environment. *Developmental Science*, *15*(1), 12–24. https://doi.org/10.1111/j.1467-7687.2011.01093.x

Bernier, A., Larose, S., Boivin, M., & Soucy, N. (2004). Attachment State of Mind: Implications for Adjustment to College. *Journal of Adolescent Research*, *19*(6), 783–806. https://doi.org/10.1177/0743558403260096

Birmingham, R. S., Bub, K. L., & Vaughn, B. E. (2017). Parenting in infancy and self-regulation in preschool: an investigation of the role of attachment history. *Attachment & Human Development*, *19*(2), 107–129. https://doi.org/10.1080/14616734.2016.1259335

Blalock, D. V., Franzese, A. T., Machell, K. A., & Strauman, T. J. (2015). Attachment style and self-regulation: How our patterns in relationships reflect broader motivational styles. *Personality and Individual Differences*, *87*(Supplement C), 90–98. https://doi.org/10.1016/j.paid.2015.07.024

Bowlby, J. (1958). The nature of the child's tie to his mother. *The International Journal of Psycho-Analysis*, *39*(5), 350–373.

Burdick, C. L. (2014). A Correlation Study on Attachment Style and GPA of Students at an Alternative Education Center. *International Journal of Academic Research in Progressive Education and Development*, *3*(4). https://doi.org/10.6007/IJARPED/v3-i4/1281

Carleton, J. A., & Padolsky, I. (2012). Wilhelm Reich's theoretical concept of mother–infant attachment as the origin of self-regulation: a neurophysiological perspective. *Body, Movement and Dance in Psychotherapy*, *7*(2), 89–100. https://doi.org/10.1080/17432979.2011.592395

Cavero, M. A. B. (2012). Relative influence of metacognitive and volitive variables in the academic achievement of baccalaureate students. *Revista Espanola de Orientacion y Psicopedagogia*, *23*(3), 63–80. https://doi.org/10.5944/reop.vol.23.num.3.2012.11462

Diamond, L. M. (2001). Contributions of Psychophysiology to Research on Adult Attachment: Review and Recommendations. *Personality and Social Psychology Review*, *5*(4), 276–295. https://doi.org/10.1207/S15327957PSPR0504_1

Diamond, L. M., & Hicks, A. M. (2005). Attachment style, current relationship security, and negative emotions: The mediating role of physiological regulation. *Journal of Social and Personal Relationships*, *22*(4), 499–518. https://doi.org/10.1177/0265407505054520

Diamond, L. M., Hicks, A. M., & Otter-Henderson, K. (2006). Physiological evidence for repressive coping among avoidantly attached adults. *Journal of Social and Personal Relationships*, *23*(2), 205–229. https://doi.org/10.1177/0265407506062470

Drake, K., Belsky, J., & Fearon, R. M. P. (2014). From early attachment to engagement with learning in school: the role of self-regulation and persistence. *Developmental Psychology*, *50*(5), 1350–1361. https://doi.org/10.1037/a0032779

Duchesne, S., & Larose, S. (2007). Adolescent Parental Attachment and Academic Motivation and Performance in Early Adolescence1. *Journal of Applied Social Psychology*, *37*(7), 1501–1521. https://doi.org/10.1111/j.1559-1816.2007.00224.x

Escobar, M. J., Rivera-Rei, A., Decety, J., Huepe, D., Cardona, J. F., Canales-Johnson, A., … Ibañez, A. (2013). Attachment patterns trigger differential neural signature of emotional processing in adolescents. *PloS One*, *8*(8), e70247. https://doi.org/10.1371/journal.pone.0070247

Fearon, R. M. P., & Belsky, J. (2004). Attachment and attention: protection in relation to gender and cumulative social-contextual adversity. *Child Development*, *75*(6), 1677–1693. https://doi.org/10.1111/j.1467-8624.2004.00809.x

Fraley, R. C., Waller, N. G., & Brennan, K. A. (2000). An item response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, *78*(2), 350–365. https://doi.org/10.1037/0022-3514.78.2.350

Gillath, O., & Karantzas, G. (2018). Attachment security priming: a systematic review. *Current Opinion in Psychology*, *25*, 86–95. https://doi.org/10.1016/j.copsyc.2018.03.001

Granot, D., & Mayseless, O. (2001). Attachment security and adjustment to school in middle childhood. *International Journal of Behavioral Development*, *25*(6), 530–541. https://doi.org/10.1080/01650250042000366

Hansen, A. L., Johnsen, B. H., & Thayer, J. F. (2003). Vagal influence on working memory and attention. *International Journal of Psychophysiology: Official Journal of the International Organization of Psychophysiology*, *48*(3), 263–274.

Hill-Soderlund, A. L., Mills-Koonce, W. R., Propper, C., Calkins, S. D., Granger, D. A., Moore, G. A., … Cox, M. J. (2008). Parasympathetic and sympathetic responses to the strange situation in infants and mothers from avoidant and securely attached dyads. *Developmental Psychobiology*, *50*(4), 361–376. https://doi.org/10.1002/dev.20302

Hofer, M. A. (2006). Psychobiological Roots of Early Attachment. *Current Directions in Psychological Science*, *15*(2), 84–88. https://doi.org/10.1111/j.0963-7214.2006.00412.x

Hortaçsu, N. (1994). Parents' Education Level, Popularity, Individual Cognitions, and Academic Performance: An Investigation with Turkish Children. *The Journal of Genetic Psychology*, *155*(2), 179–189. https://doi.org/10.1080/00221325.1994.9914770

Jacobsen, T., Edelstein, W., & Hofmann, V. (1994). A longitudinal study of the relation between representations of attachment in childhood and cognitive functioning in childhood and adolescence. *Developmental Psychology*, *30*(1), 112–124. https://doi.org/10.1037/0012-1649.30.1.112

Jacobsen, T., & Hofmann, V. (1997). Children's attachment representations: Longitudinal relations to school behavior and academic competency in middle childhood and adolescence. *Developmental Psychology*, *33*(4), 703–710. https://doi.org/10.1037/0012-1649.33.4.703

Kochanska, G., Philibert, R. A., & Barry, R. A. (2009). Interplay of genes and early mother-child relationship in the development of self-regulation from toddler to preschool age. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *50*(11), 1331–1338. https://doi.org/10.1111/j.1469-7610.2008.02050.x

Larose, S., Bernier, A., & Tarabulsy, G. M. (2005). Attachment State of Mind, Learning Dispositions, and Academic Performance During the College Transition. *Developmental Psychology, 41*(1), 281–289. https://doi.org/10.1037/0012-1649.41.1.281

Matas, L., Arend, R. A., & Sroufe, L. A. (1978). Continuity of Adaptation in the Second Year: The Relationship between Quality of Attachment and Later Competence. *Child Development*, *49*(3), 547–556. https://doi.org/10.2307/1128221

Maunder, R. G., Lancee, W. J., Nolan, R. P., Hunter, J. J., & Tannenbaum, D. W. (2006). The relationship of attachment insecurity to subjective stress and autonomic function during standardized acute stress in healthy adults. *Journal of Psychosomatic Research*, *60*(3), 283–290. https://doi.org/10.1016/j.jpsychores.2005.08.013

Maunder, R. G., Panzer, A., Viljoen, M., Owen, J., Human, S., & Hunter, J. J. (2006). Physicians' difficulty with emergency department patients is related to patients' attachment style. *Social Science & Medicine (1982)*, *63*(2), 552–562. https://doi.org/10.1016/j.socscimed.2006.01.001

Mikulincer, M. (1998). Adult attachment style and individual differences in functional versus dysfunctional experiences of anger. *Journal of Personality and Social Psychology*, *74*(2), 513–524. http://dx.doi.org/10.1037/0022-3514.74.2.513

Moss, E., & St-Laurent, D. (2001). Attachment at school age and academic performance. *Developmental Psychology*, *37*(6), 863–874. https://doi.org/10.1037/0012-1649.37.6.863

Ning, H. K., & Downing, K. (2010). Connections between learning experience, study behaviour and academic performance: A longitudinal study. *Educational Research*, *52*(4), 457–468. https://doi.org/10.1080/00131881.2010.524754

Padykula, N. L., & Conklin, P. (2010). The Self Regulation Model of Attachment Trauma and Addiction. *Clinical Social Work Journal*, *38*(4), 351–360. https://doi.org/10.1007/s10615-009-0204-6

Panzer, A., & Viljoen, M. (2004). Dissociation: a developmental psychoneurobiological perspective: review article. *African Journal of Psychiatry*, *7*(3), 11–17. https://doi.org/10.4314/ajpsy.v7i3.30168

Porges, S. W., & Furman, S. A. (2011). The Early Development of the Autonomic Nervous System Provides a Neural Platform for Social Behavior: A Polyvagal Perspective. *Infant and Child Development*, *20*(1), 106–118. https://doi.org/10.1002/icd.688

Schore, J. R., & Schore, A. N. (2008). Modern Attachment Theory: The Central Role of Affect Regulation in Development and Treatment. *Clinical Social Work Journal*, *36*(1), 9–20. https://doi.org/10.1007/s10615-007-0111-7

Schunk, D. H. (2005). Commentary on self-regulation in school contexts. *Learning and Instruction*, *15*(2), 173–177. https://doi.org/10.1016/j.learninstruc.2005.04.013

Schutz, C. M., Gallagher, M. L., & Tepe, R. E. (2011). Differences in Learning and Study Strategies Inventory Scores Between Chiropractic Students With Lower and Higher Grade Point Averages. *The Journal of Chiropractic Education*, *25*(1), 5–10. https://doi.org/10.7899/1042-5055-25.1.5

Seabi, J. (2011). Relating learning strategies, self-esteem, intellectual functioning with academic achievement among first-year engineering students. *South African Journal of Psychology*, *41*(2), 239–249. https://doi.org/10.1177/008124631104100212

Swain, J. E., Lorberbaum, J. P., Kose, S., & Strathearn, L. (2007). Brain basis of early parent-infant interactions: psychology, physiology, and in vivo functional neuroimaging studies. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *48*(3–4), 262–287. https://doi.org/10.1111/j.1469-7610.2007.01731.x

Van Aardt, A. M., & Van Wyk, C. K. (1991). Individual Learning and Study Skills of First-Year Mathematics Students and its Influence on Mathematics Achievement. In *Proceedings of the 6th Conference of the South African Association for Academic Development*. Johannesburg: University of the Witwatersrand.

van Ijzendoorn, M. H., Dijkstra, J., & Bus, A. G. (1995). Attachment, Intelligence, and Language: A Meta-analysis. *Social Development, 4*(2), 115–128. https://doi.org/10.1111/j.1467-9507.1995.tb00055.x

von der Lippe, A., Eilertsen, D. E., Hartmann, E., & Killen, K. (2010). The role of maternal attachment in children's attachment and cognitive executive functioning: a preliminary study. *Attachment & Human Development*, *12*(5), 429–444. https://doi.org/10.1080/14616734.2010.501967

Weinstein, C., & Palmer, D. (2002). LASSI User's Manual, LASSI User's Manual, Learning and Study Strategies Inventory, 2nd Edition. H&H Publishing Company, Inc.

West, C., Kurz, T., Smith, S., & Graham, L. (2014). Are study strategies related to medical licensing exam performance? *International Journal of Medical Education*, *5*, 199–204. https://doi.org/10.5116/ijme.5439.6491

West, C., & Sadoski, M. (2011). Do study strategies predict academic performance in medical school? *Medical Education, 45*(7), 696–703. https://doi.org/10.1111/j.1365-2923.2011.03929.x

West, K. K., Mathews, B. L., & Kerns, K. A. (2013). Mother–child attachment and cognitive performance in middle childhood: An examination of mediating mechanisms. *Early Childhood Research Quarterly*, *28*(2), 259–270. https://doi.org/10.1016/j.ecresq.2012.07.005

Yip, M. C. W. (2012). Learning strategies and self-efficacy as predictors of academic performance: A preliminary study. *Quality in Higher Education*, *18*(1), 23–34. https://doi.org/10.1080/13538322.2012.667263

Zeinali, A., Sharifi, H., Enayati, M., Asgari, P., & Pasha, G. (2011). The mediational pathway among parenting styles, attachment styles and self-regulation with addiction susceptibility of adolescents. *Journal of Research in Medical Sciences: The Official Journal of Isfahan University of Medical Sciences*, *16*(9), 1105–1121.

Zimmerman, B. J. (1990). Self-Regulated Learning and Academic Achievement: An Overview. *Educational Psychologist*, *25*(1), 3–17. https://doi.org/10.1207/s15326985ep2501_2