



Attachment problems in childhood and the development of anxiety in adolescents: A systematic review of longitudinal and prospective studies

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ABSTRACT

The association between early relationships and the experience of infant and mother, and the subsequent development of the child through their life span has long been studied. Attachment, as a most prominent construct in early child development, has been the focal point of investigation since the inception of the theoretical concept by Bowlby. In recent years, research has expanded to examine the effect of attachment on the mental health and socio-emotional development of young children and their on-going adjustment into adolescence. However, most studies in the field concentrated on the relationship of childhood attachment and internalising symptoms as a generic assessment of mental health problems. To provide more precise information on the effect of attachment insecurity on individual mental health problems, a systematic review (the first in a series) of available longitudinal and prospective studies was conducted. 11 studies were identified after an extensive search of the literature in accordance to the PRISMA guidelines. Of these, 4 satisfied all selection criteria and provided sufficient data on the effect of attachment insecurity during infancy or early childhood and anxiety in adolescence. Information was extracted and analysed systematically from each study and tabulated. The overall results obtained from these studies indicated a significant and possible causal relationship between attachment insecurity during infancy or early childhood and the development of anxiety in adolescence. These results were discussed in light of theoretical and practical preventive implications.

1. Introduction

Attachment theory was first proposed by John Bowlby as a conceptual framework to understand human development, particularly during the very early period of infancy and early childhood (Bowlby, 1997). Starting from the initial, mainly survival, function of attachment of infant to parent (particularly the mother), the theory highlights the importance of early attachment experiences on a broad range of childhood and adult development (Bowlby, 1997). The framework has been established as a prominent developmental theory, with important contributions by Ainsworth and colleagues' Strange Situation Procedures (SSP, Ainsworth, Blehar, Waters, & Wall, 1978).

While applying the SSP to young children and their mothers, Ainsworth et al. observed that different young children responded differently to their mother when the mother-child dyad was reunited after a short, yet stressful separation (Ainsworth et al., 1978). Based on these observations, Ainsworth et al. (1978) postulated four types of attachment behaviours. In most cases, the child was able to attach to the mother securely using the mother as a secure base for exploration when

the mother was present and resolve his/her distress effectively again using the mother as a source of comfort (secure attachment). However, some ignored their mothers upon reunion yet they were still anxious (avoidance). Others demonstrated ambivalence behaviours where, on the one hand, they exhibited a desire to seek comfort from the mother but, on the other, were not effectively soothed by contact with the mother (resistance). In some cases, the child exhibited behaviours that totally deviated from the normal pattern reflecting a breakdown in any attachment (disorganisation) (Granqvist et al., 2017; Main & Hesse, 1990). Infants having a disorganised attachment style to their caregivers are found to display behaviors that lack "coherent pattern" (Schneider, 2014, p.339) and fluctuate randomly (Mikulincer & Shaver, 2016, p.143). When experiencing distressing situations, infants with a disorganised attachment would approach their caregivers for comfort. However, their experience of negative responses from caregivers would result in the infants' conflicting and confusing behavior of wanting to approach yet also wanting to stay away (Main & Hesse, 1990). Of interest to most researchers, and as reflected from the literature, were comparisons between the secure and other attachment

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behaviours including insecure attachment and disorganisation. Hence, the current study also adopts this classification.

The association between early relationships and the experience of infant and mother, and the subsequent development of the child through their life span has long been postulated (Freud, 1905). With the rise in popularity of attachment theory, much attention has been paid to the relationship between parent-child attachment and psychosocial development among young children. Most studies focused on mother-child dyads (Alhusen, Hayat, & Gross, 2013; Dubois-Comtois & Moss, 2008; Kennedy, Betts, & Underwood, 2014). In recent years, research has expanded to examine the effect of attachment on the mental health and socio-emotional development of young children and their on-going adjustment into adolescence (Obsuth, Hennighausen, Brumariu, & Lyons-Ruth, 2014; Pickreign, Toth, Rogosch, & Cicchetti, 2013; Raby, Roisman, Fraley, & Simpson, 2015; Toth, Sturge-Apple, Rogosch, & Cicchetti, 2015; Zeanah, & Gleason, 2015). In the growing volume of literature on the relationship between attachment and mental health issues, externalising problematic behaviours and internalising symptoms have been the main foci (Fearson, Baskermanns-Kranenburg, van Ijzendoorn, Lapsley, & Roisman, 2010; Groh, Roisman, van Ijzendoorn, & Baskermanns-Kranenburg, 2012). Groh et al. (2012) conducted a systematic review and meta-analytic study to explore the relationship between infant and childhood attachment and internalising symptoms, including anxiety, depression, and somatic complaints. After reviewing 42 independent studies ($N = 4614$), the international team found that, irrespective of the age of assessment of the internalising symptoms, there was a small yet significant association between insecure attachment, as a generic classification including avoidance, resistance, and disorganised attachment, of the infant to the mother and internalising symptoms with a small estimated effect size of about 0.15 ($d = 0.15$, 95% C.I. = 0.06–0.25). In a sub-sample ($N = 3119$) that differentiated avoidance from other classifications of attachment, similar results were also found for those young children who had exhibited avoidant attachment behaviour and internalising symptoms with an estimated effect size of 0.17 ($d = 0.17$, 95% C.I. = 0.03–0.31). However, in another sub-sample of studies with a size of 3005 that provided data on disorganised attachment, no significant relationship between disorganised attachment and internalising symptoms was found ($d = 0.08$, 95% C.I. = -0.06–0.22).

As the first meta-analytic study in this area, Groh and colleagues adopted a thorough approach, with the inclusion of longitudinal studies and the provision of quantitative estimate on the effect size (Groh et al., 2012). However, there was a major limitation. The study focused on internalising symptoms as a generic outcome measure of a spectrum of many different problematic mental health issues in early childhood. These mental health issues might also have a significant impact on on-going development and adjustment into adolescence. The effect of poor attachment at infancy and during early childhood on the development of different mental health issues, such as anxiety and depression, might vary. There would also be different causal pathways, depending on the nature and the formulating characteristics of these disorders. Considering these different mental health issues as a single group is a very broad conceptual classification for a precise calculation of a quantitative measure in effect size. The small effect size estimated might be due to a dilution effect of the inclusion of the stronger effect of attachment on one or two mental health problems, with some other weaker effects. To bridge this gap, the aim of the current study is to examine the effect of poor attachment on the subsequent development of various prominent mental health problems in adolescents. In this study, poor attachment includes insecurely attached, avoidance, resistance, and disorganisation. As the first in a series of examinations, this study focused on the effect of poor attachment in infancy, and early and mid-childhood, on the development of anxiety in adolescents. The authors acknowledge there is a potential effect of paternal/other attachment on mental health of children and adolescent, however, after conducting extensive literature search, no paper that fits the scope and criteria of

the current study was identified, as a result, this paper mainly focused on the effect of maternal attachment on children and adolescent mental health.

2. Methods

PRISMA guidelines for systematic reviews were followed during the literature search and the subsequent review process to ensure a structured and systematic approach (Moher, Liberati, Tetzlaff, & Altman, 2009). Five major medical, developmental, and psychological literature databases were searched including (1) PubMed, (2) SCOPUS, (3) CINAHL, (4) Web of Science, and (5) ERIC.

For the current topic of attachment problems and anxiety, the syntax used for the search was: ("attachment" OR "mother infant attachment" OR "maternal attachment" OR "infant attachment" OR "Secure attachment" OR "insecure attachment" OR "ambivalent attachment" OR "attachment styles" OR "attachment behaviour" OR "parent infant attachment" OR "mother infant relations") AND ("anxiety" OR "separation anxiety" OR "general anxiety" OR "social anxiety" OR "generalised anxiety disorder" OR "anxiety symptoms"), with syntax entry being slightly modified as per database requirements. Restrictions were imposed to ensure the studies returned were peer-reviewed journal articles in English, published in the last two decades between 1990 and November 2017.

The software 'EndNote' was used to organise, store, and collect the titles and abstracts retrieved from the initial literature search. Several steps were undertaken to ensure that studies selected for final data extraction were of high suitability in accordance of this review's aims:

Titles were assessed for relevance by analysing keywords within the title

- 1 Following title assessment, the third author conducted initial analysis on the abstracts to ensure sample age was between 0–18 years, and that the study type was longitudinal. Abstracts were also analysed independently by the first and third authors for accurate section.
- 2 Following abstract assessment, full texts were examined in order to assess suitability for final data extraction into a table of contents. The second and third authors reviewed the full texts independently, leading to a general consensus. Any disputes were mediated by the first author.
- 3 Reference lists for the papers chosen for data extraction were also examined in order to procure relevant studies that might have been missed during initial literature search.

For the selection of studies, the following criteria were applied in order to identify publications suitable for inclusion in this systematic review:

- 1 Publications with a longitudinal study design, published between 1990 and November 2017;
- 2 Studies that provided clear descriptive statistics, allowing the authors to accurately assess whether attachment assessment was conducted during infancy or early-to-mid-childhood, with a follow-up assessment for anxiety symptoms conducted during early to late adolescence;
- 3 Studies did not include maternal figures with pre-existing mental health disorders such as depression or anxiety since these pre-existing mental health problems were significant confounders in the investigation of the causal relationship between attachment and mental health;
- 4 Studies included the tools, procedure, and analysis results for both the attachment assessment to maternal figure, and the follow-up mental health assessment;
- 5 Studies published in the English language for full comprehension of the content;

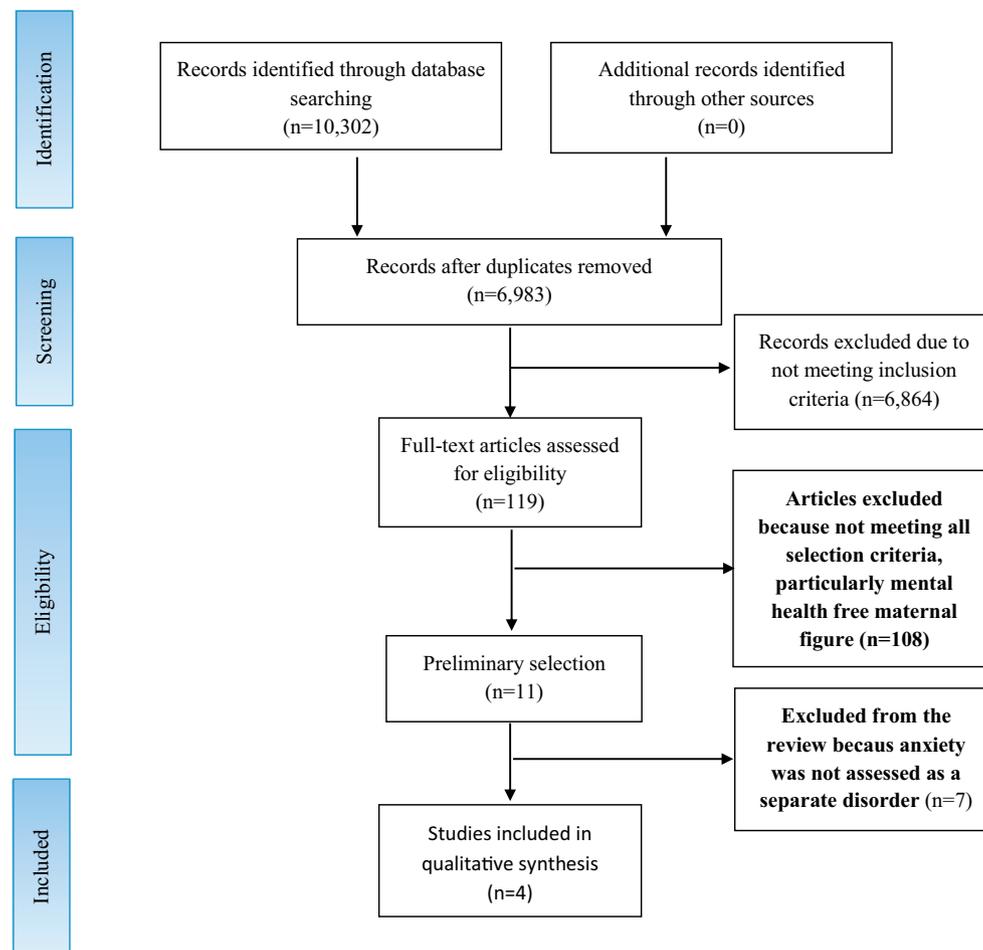


Fig. 1. PRISMA flowchart of search for peer-reviewed journal articles.

6 Outcomes that were not related to anxiety were excluded from this review.

After final assessment of paper suitability, data was extracted into a table of contents. The information extracted included study location, description of study design, and information on the demographic characteristics of the sample. Also reported were the tools or instruments used to assess attachment of the child and anxiety, as well as the results relating to the relationship between attachment styles in early to mid-childhood, and anxiety symptoms in early to late adolescence. Due to the observational nature of these studies, a descriptive approach was used to comment on any potential biases and/or limitations of the studies. This information was then summarised and analysed to ascertain the potential causal relationship between attachment at early to mid-childhood period to one's parent, especially the mother, and subsequent anxiety in early to late adolescence. The systematic literature searches and review process was summarised schematically in Fig. 1 following the PRISMA chart format (Moher et al., 2009).

3. Results

An extensive search was conducted, while applying the procedures described in the methods, resulting in 11 articles on a longitudinal or prospective study in the English language on the relationship between childhood attachment to parents and subsequent mental health problems (Brenning, Soenens, Braet, & Beyers, 2013; Brumariu & Kerns, 2010; Dalairre & Weinraub, 2005; Dalairre & Weinraub, 2007; Glazebrook, Townsend, & Sayal, 2015; Jakobsen, Horwood, &

Fergusson, 2012; Lecompte, Moss, Cyr, & Pascuzzo, 2014; Priddis & Howieson, 2012; Raja, McGee, & Stanton, 1992; Sund & Wichstrøm, 2002). Of these, 5 were selected as potential candidates for inclusion in the review for anxiety. A closer examination of the full text of these articles revealed that only 4 satisfied the selection criteria with sufficient information on the relationship between attachment problems in infancy/childhood and anxiety in a later stage of development (Brumariu & Kerns, 2010; Dalairre & Weinraub, 2005; Dalairre et al., 2007; Lecompte et al., 2014). One of these included both anxiety and depression as the outcome measures (Lecompte et al., 2014). Hence, it was also included on the list of articles to be analysed for results on anxiety. The main reasons for the exclusion of other articles were that they either did not provide sufficient information on the assessment of the exposure and/or the outcome variables, or the focus of the study was not on infancy/childhood attachment but attachment at a later stage of life development such as adolescence (Jakobsen et al., 2012). Detailed information was extracted from these articles and summarised in Table 1.

In terms of the study design, all but one utilised an observation approach to collect baseline data on mother-child attachment. Brumariu's study, due to the fact that the target participants were 3rd grade children, was the only study which utilised a psychometric tool, the Attachment Security scale, to elicit responses from children (Brumariu & Kerns, 2010). The cohorts were followed for outcome measures on anxiety with follow-up periods ranging from 2 to 7 years. All but one of these studies were small scale, with a sample size less than one hundred. The largest study was a secondary data analysis study by Dalairre et al. with more than 800 children and their parents

Table 1
Information extracted from individual longitudinal or prospective cohort studies on infant/childhood attachment and anxiety in children and adolescents.

Reference (Author, year, place)	Participants	Study methodology	Exposure, confounding, outcome variables & measures	Method of analysis and variables adjusted	Results	Comments
Dalairre et al. (2007), Pennsylvania USA	This was a secondary data analysis utilising the data collected for Phase I and II of the National Institute Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD). A sample of 136 families were drawn from the original study. Ninety-nine mother and child dyads ($N = 99$) were recruited in this study. The mean age of children at the time of final assessment was 6 years and 3 months with 52% males.	Mother and child dyads were followed since the child was 1 month old until the child was at first grade (about 6 years old). Baseline assessments on important variables were conducted at 6 months old then at regular intervals.	<i>Exposure:</i> Child's secure vs insecure attachment to mother. <i>Measures:</i> Child's attachment was assessed using SSP at 15 months through observation with videos taping. <i>Confounding:</i> Maternal sensitivity evaluated by the free play interaction tasks with the child. <i>Measures:</i> Maternal separation anxiety measured by the Separation Anxiety Scale; child's externalizing and internalising behavior was assessed using the Social Skills Rating System; child's temperament was assessed at 6 months using the Infant Temperament Questionnaire. <i>Outcome:</i> Child separation anxiety <i>Measures:</i> Modified Child Puppet Interview designed to elicit children's perception of their feelings and behaviours. Assessments were conducted when the child was 6 years old.	Relations between children's separation anxiety and infant-mother attachment security was examined using t-tests; ANOVA with pairwise comparisons. Simultaneous regression analysis was used to test the incremental predictive utility of each of the predictor variables.	Bivariate analysis results suggested that Children's self-reported separation anxiety at age 6 years differed significantly between the securely and insecurely attachment groups [$F_{(8)} = 2.48, p = .015$] with insecurely attached children rated significantly higher. Regression analysis results also confirmed that infant-mother attachment was a significant predictor of child's separation anxiety at 6 years old.	<i>Limitations:</i> The study was limited by a small sample and the attrition of the original recruited sample. A small sample precluded the study from testing the relationship between subtypes of the insecurely attachment and separation anxiety in children.
Dalairre et al. (2007), Pennsylvania USA	This was a secondary data analysis using data collected for Phase I and II of the National Institute Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD). 1364 families were recruited to the original study starting in 1991. Though not all of the 1364 original participants completed each and every assessment, there are complete data from 866 mother-child, 662 father-child, and 831 teacher-child dyads for the regression analyses.	Families were followed since the child was 1 month until the time of study outcome assessment when the child at first grade.	<i>Exposure:</i> Child's secure vs insecure attachment to mother. <i>Measures:</i> Child's attachment was assessed using SSP at 15 months through observation with videos taping. Assessment was conducted when the child was 15 months. <i>Confounding:</i> Mothers reported of number of negative life events (NLE) the family experienced over the past 12 months when the child was 4.5yrs using the Life Experiences Survey Questionnaire. Maternal sensitivity evaluated by the free play interaction tasks with the child. Family income computed as an income-to-needs ratio when the child was 1, 6, 15, and 36 months. Prior level of anxiety and aggression assessed by mother's report on the child's symptoms using the Child Behavior Check List (CBCL). <i>Outcome:</i> Child's anxiety. Behaviour Checklist (CBCL) completed by mothers, fathers, and teachers at 1st Grade.	A series of hierarchical regression analyses were performed with a focus on the interaction effect of NLE and attachment on anxiety. Additional analyses used latent variable Structural Equation Modelling (SEM) with the maximum likelihood methods for parameter estimates.	Attachment security at 15 months and number of NLE interacted to predict both mothers' ($\beta = -0.30, p < .01, f^2 = 0.01$) and teachers' ($\beta = -0.33, p < .05, f^2 = 0.02$) reports of children's anxiety. These results were confirmed with the SEM approach that an interaction between NLE and attachment security at 15 months was a significant predictor of child's anxiety at first grade.	<i>Strength of the study:</i> Large sample size that allowed an investigation on the interaction effect of other variables with attachment on anxiety. Inclusion of a number of possible confounding variables of childhood anxiety. Multiple informants for richer data and better validity of results.

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Table 1 (continued)

Reference (Author, year, place)	Participants	Study methodology	Exposure, confounding, outcome variables & measures	Method of analysis and variables adjusted	Results	Comments
Brumariu and Kerns (2010), Kent USA	Mother and child dyads were recruited when the child was in the 3rd grade with 104 dyads (51 girls, 53 boys, mean = 9.1yrs; SD = 0.45yrs). 74 dyads were reassessed again when he child reached 5th grade (mean = 10.92yrs; SD = 0.42yrs)	Mother dyads were assessed in a 2-hour laboratory session for baseline measure then reassessed 2 years later. During baseline assessment mother and child attachment was measured using a self-reported questionnaire. Social anxiety of the child was evaluated 2 years later.	<p>Exposure: Mother-child attachment security. Measures: Attachment Security scale with 15 items and a 4-point Likert response rating aiming to assess children's perceptions of their attachment with their mothers. Confounding: Child's coping measured by the Coping Strategies Questionnaire. Outcome: Child's social anxiety in middle childhood including fear of negative evaluation, social avoidance and distress in new situation, and general social avoidance and distress. Measures: A revised version of the self-reported Social Anxiety Scale for Children.</p>	Correlations were calculated between social anxiety variables and scores for each attachment pattern. Regression analyses were used to assess how the three attachment patterns (secure, ambivalent and avoidant) collectively and uniquely predicted each of the three social anxiety dimensions (Fear of Negative Evaluation from Peers, Social Avoidance and Distress Specific to New Situation, and Generalised Social Avoidance and Distress)	After adjusting for possible confounding variables, including age and sex, ambivalent attachment at baseline was the only significant predictor of all three types of social anxiety at reassessment.	<p>Limitations: Small sample size provided limited power for the study. Reliance on self-reported questionnaires to assess both attachment and social anxiety introduced shared method variance, which may increase the estimates of the associations between the two types of measures. It would be beneficial to include reports of social anxiety symptoms from other reliable sources (e.g., parents, teachers).</p>
Lecompte et al. (2014), Montreal, Canada	As part of an ongoing longitudinal project on developmental adaptation, mother-child dyads were recruited when the child was 3-4 years old through preschools in various SES communities in Montreal. 68 (72% of the original sample were included in this study with 33 girls and 35 boys (mean age = 3.7yrs; SD = 4.4mths). They were followed for 7 years (mean age = 11.7yrs; SD = 4.3mths) for the study outcome measure.	Mother-child dyads were assessed at the university laboratory for baseline data collection. They were reassessed at the laboratory again 7 years later.	<p>Exposure: Mother-child attachment security. Measures: The Separation-reunion procedure was used to assess mother-child attachment security by observation. Attachment patterns were classified in secure, insecure-organised, and disorganised. Confounding: Socio-demographic variables including mother's age, income, and level of education. Self-competence of the child measured by the Self-Perception Profile of Children (SPPC). Outcome: Generalised Anxiety Disorder symptoms. Measures: Assessed by the self-reported Dominic Interactive Questionnaire.</p>	<p>Differences in adolescent anxiety among various groups of preschool attachment were tested using ANCOVA with control of confounding variables. Pairwise comparisons were conducted as post-hoc analyses. Hierarchical regression analyses were used to further examine the possible mediational role of self-esteem on anxiety.</p>	<p>Results indicated significant differences in anxiety scores across three attachment groups ($F_{(2,64)} = 4.37, p < .05$). Post hoc analyses results suggested that preschool disorganized attachment scored significant higher on anxiety symptoms in comparison to the securely attached group ($t_{64} = -2.88, p < .05, d = 0.72$). Regression results indicated that, after adjusting for demographic variables and self-esteem, preschool disorganised attachment was still significantly predictive of anxiety symptoms ($F_{(1,64)} = 7.21, p < .01$), $\beta = 0.30, p < .01$).</p>	<p>Limitations: Owing to the restricted sample, both the avoidant and ambivalent groups were combined into an insecure-organized group, thus limiting the possibility of examining more specific differences between these groups. The use of a nonclinical sample also contributed to this narrower range of insecure classifications, as well as behavior problem scores.</p>

and teachers (Dalairre et al., 2007). For the outcome, namely anxiety, three of the studies used the psychometric approach with different measuring instruments for childhood anxiety (Brumariu & Kerns, 2010; Dalairre et al., 2007; Lecompte et al., 2014). Of these, two utilised a self-reported scale that sought responses from children on various scale items (Brumariu & Kerns, 2010; Lecompte et al., 2014). By design, one of these three used parents and teachers as informants to complete the Child Behaviour Check List (CBCL) questionnaires. In another Dalairre's study, the Child Puppet Interview was used as a tool to collect data from participants (Dalairre & Weinraub, 2005). It was also noted that the outcome measures, though generically under the classification of anxiety, varied across studies and included a range of anxiety-related problems, such as separation anxiety, general anxiety, social anxiety, and generalised anxiety disorder symptoms. In all these studies, appropriate statistical analytical approaches were employed such as regression modelling and Structural Equation modelling with adjustments for some potential confounding factors. Two of these studies also explored the possible interactive or mediational effect of poor attachment with other variables on subsequent anxiety (Dalairre et al., 2007; Lecompte et al., 2014). The results of these studies indicated infant/childhood attachment was significantly related to anxiety in the subsequent development of children. In the earlier study by Dalairre, it was found that children's self-reported separation anxiety at age 6 years differed significantly between the securely and insecurely attachment groups ($t_{98} = 2.48, p = .015$) with insecurely attached children rating significantly higher (Dalairre et al., 2007). In another study by the same author, it was also found that insecure attachment of the child at 15 months and the number of negative life events interacted to predict both mothers' ($\beta = -0.30, p < .01, f^2 = 0.01$) and teachers' ($\beta = -0.33, p < .05, f^2 = 0.02$) reports of children's anxiety at first grade. These results were echoed in the study by Brumariu and colleagues where, after adjusting for possible confounding variables, ambivalent attachment at baseline (3rd grade) was a significant predictor of different types of social anxiety at reassessment 2 years later (Brumariu & Kerns, 2010). The most recent study by Lecompte also provides evidence suggesting disorganised attachment in preschoolers was significantly predictive of anxiety symptoms ($F_{(1,64)} = 7.21, p < .01, \beta = 0.30, p < .01$) at follow-up 7 years later (Lecompte et al., 2014). In terms of the limitations identified from these studies, the most common one was that, due to the **small sample size**, sub-group analyses or analyses by different types of attachment, could not be performed. By the same token, some interaction effects between attachment and other study variables on anxiety could not be carried out.

4. Discussions and conclusion

Through reviewing the existing evidence provided by well-designed studies, the research team **aimed** to examine the possible causal relationship between poor attachment at infancy and early childhood to the parent, mainly the mother, and the subsequent development of mental health problems in adolescence. As the first of a series, anxiety is the focus of the current study. It is hypothesised that poor attachment, including insecure and disorganised attachment, during infancy and early childhood has a detrimental effect on the development of the child and is a potential cause of mental health problems during adolescence. The results obtained from this review indicate that poor attachment at infancy and early childhood is significantly related to symptoms of anxiety or diagnosed anxiety disorders in adolescence. These results are consistent and in line with the finding in the literature and, in particular, the meta-analytical study by Groh et al. (2012), although the focus of their study was on generic internalizing symptoms (Bosmans, & De Smedt, 2015; Cassidy, Lichtenstein-Phelps, Sibrava, Thomas, & Borkovec, 2009; de Minzi, 2006; Glazebrook et al., 2015; Sonja Breinholst, Esbjørn, & Reinholdt-Dunne, 2015;). Based on the longitudinal and prospective design of the included studies for review, the evidence provided is of a higher level in terms of an evidence-based

model for medical and health research (Mikulincer & Shaver, 2012). Hence, they lend greater confidence to the conclusion that the association between poor attachment at infancy and early childhood, and mental health problems in adolescence could be a causal relationship (Mayer, 2010). However, given the small sample of the current study one should be cautious in drawing a definitive conclusion on the causal relationship between attachment insecurity in infancy and childhood and the development of anxiety symptoms in adolescence. It is also worth noting that the exclusion of studies involving maternal figures with pre-existing mental health disorders, such as depression or anxiety, is mainly for the reason of minimizing the confounding effect of the pre-existing condition of the mother on the association between attachment and subsequent mental health issue of the child. While considering the role of the mother's pre-existing condition in the relationship between the exposure (poor attachment) and the outcome (subsequent mental health problem), there could be two possible scenarios, namely modification or mediation. In case of modification, the association between the exposure and the outcome will be affected such that the effect of the exposure on the outcome is differentially enhanced or reduced depending on the status of the modifier (either the mother has a pre-existing condition or not). In case of the mediation, the effect of the exposure on the outcome will largely or partially be mediated through the mediator (i.e. the pre-existing condition) and thus the direct effect of the exposure will be much reduced. In order to ascertain the "pure" relationship between poor attachment and subsequent mental health problems in the child, the exclusion criterion was applied in this study. However, the drawback is that the number of studies that could be included for analysis would be reduced.

The results obtained from these empirical studies have raised an important question as to why poorly attached young children would have a higher risk of developing mental health problems at a later stage of development. In the original exposition of the Attachment Theory, Bowlby provided some insights in the mechanism of the potential causal relationship between attachment insecurity and psychopathology (Bowlby, 1997). The possible mechanism or causal pathway between attachment insecurity and mental health problems has been succinctly summarised by Mikulincer and Shaver (2012) who state that the fundamental reason for the development of mental health problems in individuals with poor attachment during early childhood lies in an increase in general vulnerability to mental disorders (Mikulincer, & Shaver, 2012). It is suggested that an enhancement in vulnerability is the result of attachment insecurity on three psychological aspects of the individual: self-representation, emotion regulation, and problems in interpersonal relationship (Mikulincer, & Shaver, 2012). For self-representation, poor attachment to a sensitive and responsive figure at infancy and early childhood fails to provide a foundation for a proper and healthy formation of selfhood resulting in a lack of self-cohesion. As the child develops, this may lead to self-doubt, lack of self-esteem, and the need to constantly seek approval from others (Park, Crocker, & Mickelson, 2004; Wei, Heppner, & Russell, 2006). In terms of emotion regulation a secure attachment between the child and the parental figure, through stable interactions, allows the child to develop constructive emotion regulation strategies. It also provides opportunities for the child to learn how to use these strategies properly. Acknowledgement and proper expression of one's emotions has been identified as a very important aspect of good mental health. On the other hand, insecure attachment of an infant may result in a reliance on other attachment strategies for its own survival. These alternative strategies could be destructive in terms of preventing the child from developing essential social skills when interacting with others. This may result in a severe lack of communication skills and perception in interpersonal relationships, which in turn greatly affect the mental state of the individual (Larose & Bernier, 2001). In addition, the genetic factor may also play an important role in the causal pathway between attachment insecurity during early childhood and anxiety formation in the later stage of life, particularly in the clinical population of mother having

anxiety disorders (Lebowitz, Leckman, Silverman, & Feldman, 2016). Adopting the concept of Mikulincer, & Shaver, maternal anxiety disorder could be an important risk factor for the increase of vulnerability to mental ill health in young children through a poor and insecure attachment relationship between mother and child. This complex and interactive relationship among genetic disposition, attachment behavior, and mental health issues in both mother and child should be further explore in future studies.

There are some important implications of the results obtained from this study, particularly in terms of early prevention and intervention of mental health problems in adolescence. The potential causal relationship between attachment insecurity at infancy and early childhood, and the development of mental health problems at a later life stage, suggests possibilities for the creation of effective early prevention and intervention strategies for youth mental health issues. The importance of parent-and-child secure attachment should be strongly advocated in the pre-and-peri-and-postnatal period, as well as child health and early childhood settings. A better understanding of various attachment styles in parents-to-be and new parents would also be helpful to equip and prepare parents for better attachment with their children (Dozier et al., 2009; Hazan & Shaver, 1987). A number of well-designed studies have demonstrated the effectiveness of parenting intervention on the development of young children even among children with attachment problems resulting in significant improvements (Wright et al., 2015). In fact, attachment has already become part of the parenting training program in some part of the world (website <http://www.attachmentparenting.org/apifaqs/parenteducation>). These training strategies should be more commonly provided to young parents or parents-to-be to provide better foundations for the mental health of their children.

In conclusion, results from the systematic review suggest that attachment insecurity in infancy and early childhood could be one of the causal factors, and is part of the causal pathway, of youth anxiety. More attention should be paid to enhancing the understanding of parents' knowledge in the attachment styles and skills of attachment of young children. This is potentially an early prevention and intervention strategy of youth mental health problems.

Declaration

Ethics approval and consent to participate

The study obtained ethics approval from the Human Research Ethics Committee of the University of Technology Sydney (UTS Ethics Application Number: ETH160765). This was a systematic review of the literature and did not involve any study participants, thus informed consent was not applicable.

Consent for publication

All co-authors have granted consent to publish this paper in Systematic Reviews

Availability of data and material

All materials and data were available online.

Competing interests

The authors declared no conflict of interest in any kind for the conduct of the study.

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Authors' contributions

LTL, the principal investigator had designed the study, involved in the review of articles, data extraction, and writing the manuscript. AR involved in the systematic literature search of articles, selection of suitable articles, extraction of data, and writing the manuscript. MKL also involved in the selection of articles, data extraction, and writing the manuscript.

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