Attachment Styles and Resource Management Strategies

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Abstract

According to attachment theory, human infants have an innate need to seek proximity and comfort from their primary caregivers. In this research, we investigated the relationship between attachment styles and resource management strategies in terms of impulsivity, risk propensity and behavior, health concerns and health practices, bodily energy level, future orientation, and buying tendency based on evolutionary and life history theories of human social development. By using self-report approach in study one, 164 university students from a university in Beijing, China completed measures on attachment to primary caregiver and resource management strategies. In study two, 81 adolescent students from a primary and secondary school in Guangzhou, China completed self-report measures on resource management strategies and attachment coping strategies with primary caregiver together with two experimental tasks supplemented by mothers' report on the adolescents' attachment coping strategies. Results from regression analyses in study one showed that avoidant attachment was predictive of resource management strategies in impulsivity, risk propensity, and health concerns whereas anxious attachment was predictive of bodily energy deficiency. Results from study two indicated that secure coping strategy was predictive of future orientation, and avoidant coping strategy was predictive of impulsivity and health practices. Hypotheses were partly supported. Implications and future directions were discussed.

Key words: attachment styles, resource management strategies, life history theory, evolutionary theory

摘要

依戀理論指出人類嬰孩與生俱來就有親近主要照顧者的需要。此研究以進化及生活史理論作基礎，探討人們與主要照顧者所建立的依戀模式和資源管理策略之間的關係。這些資源管理策略包括：易衝動、冒險傾向和行爲、健康關注與實踐、體力水平、未來取向、及購物傾向。在研究一和二中，分別有一百六十九位來自中國北京的大學生及八十一位來自廣州的青年學生參與並回答了一系列與依戀模式及資源管理策略相關的問題。研究一的結果顯示，逃避型依戀模式能有效地預測易衝動、冒險傾向及健康關注的資源管理策略；而焦慮型依戀模式能有效地預測體力不足的資源管理策略。研究二的結果顯示安全型依戀模式能有效地預測未來取向；而逃避型依戀模式則有效地預測了易衝動及健康關注與實踐的資源管理策略。數據支持了部分假設。討論部份對未來的研究方向提出了一些建議。

關鍵詞：依戀模式、資源管理策略、生活史理論、進化論

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Chapter 1: Introduction

1.1 Research Background

According to mainstream psychology (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969, 1973, 1980; van IJzendoorn, 1995), attachment styles are internalized responses to child rearing styles such that a warm and consistent, in contrast to a cold and rejecting or an irresponsive and inconsistent, care-giving style leads to secure rather than insecure, i.e., avoidant or ambivalent attachment. Further insight from evolutionary psychology identifies the mediating role of parenting in registering environmental conditions to which organisms respond by activating different life history tradeoffs to optimize resource allocation among growth and development, early reproduction, and immediate survival (Belsky, 1997; Belsky, Steinberg, & Draper, 1991; Chisholm, 1993, 1996, 1999; Chisholm, Quinlivan, Petersen, & Coall, 2005; Del Giudice, 2009; Draper & Harpending, 1982; Ellis, 2004; Lempers, Clark-Lempers, & Simons, 1989; Quinlan, 2007; Simpson & Belsky, 2008). Attachment styles are such life-history strategies to be activated early on in life to adapt to the environmental conditions that are mediated by early child caring styles and that, in the ancestral past at least, will most probabilistically continue throughout adult life. In this light, different attachment styles are adaptive to different and relatively unchanging environmental conditions inherited from childhood. Attachment is an adaptive strategy that a child must develop early on in life to best adapt to the environment in which he or she is born. Because a childhood inherited environment is likely to remain the same throughout a person's life, childhood attachment as an internal working model remains stable across the adulthood years (Hazan & Shaver, 1994a;

Mikulincer & Shaver, 2007). These stable strategies are used to cope with the unchanging conditions of the environment.

Two relevant environmental conditions are resources including energy and nutrients and safety or protection from risks and danger (Chisholm et al., 2005). These two environmental conditions directly interact with a human being whereas other environmental factors represent causes or mediators to result in different resources and different safety. For example, climate or weather affects crop harvest and growth of other vegetations. Vegetation in turn affects the whole food chain to result in a richer vs. poorer nutrient and energy resources for different animals along the food chain. The other is risk or safety which constitutes an important environment that determines a person's survival.

Numerous observations among nonhuman animals show that organisms respond to food supplies and predation by shifting their reproductive and other life history tradeoff strategies (Vergara, Fargallo & Martínez-Padilla, 2010), including behavioral changes in the offspring in response to food supplies of the parental generation (Korpimäki et al., 1996; Laaksonen et al., 2004). Extending these theories and observations, we propose that attachment styles are strategies that must be activated early on in life and must stay relatively unchanging throughout life to best adapt to the resource and risk conditions inherited from childhood that, in the ancestral past, would continue throughout adulthood. We hypothesize that different attachment styles formed early in life are correlated with such resource management variables as attitudes toward and behaviors concerning physical health and bodily energy level, monetary buying, risk taking, future orientation, and impulsivity during adulthood.

There are two assumptions. First, a prolonged human childhood is well buffered from the external environment by extensive adult care, including mothering and parenting and other kin and non-kin care (Hrdy, 1999). This is in contrast to other species, e.g., fish, which, as newborns, have evolved mechanisms to respond directly to the environmental conditions such as food supplies and predatory risks (Chapman, Morrell, & Krause, 2010; Stein, 1977). Within a protected human ecology, attachment serves as the mechanism by which humans, first as children and then as adults, respond to external environmental conditions, namely, resources and risks. Because the environmental conditions are first mediated through child caring styles, in response to which attachment styles are formed, attachment, in the form of an internal working model, is closely involved in and continues to guide intimate relationships in both childhood and adulthood (Collins & Sroufe, 1999). However, because its primary life history utility function is to adjust life history strategies to best adapt to external living conditions, attachment is hypothesized to be involved in and to guide management of risks and resources including internal physical health, bodily energy level, and external resource utilization.

Since humans are born in an altricial state, they need protection and care from a wiser, stronger adult (Bowlby, 1969, 1973). Being so helpless and immature, they cannot directly assess the conditions of the environment they are born into and they are too weak to fight against any danger and risks that are present in the environment. Their primary caregiver, mother in most cases, acts as the mediator between the environment and the child and also serves as a filter for the child to learn of the conditions of the environment in a less dangerous mode. In ancestral past, a mother's parenting style was likely to be responsive to the

environmental conditions they were inheriting. From the way a mother reared the child (whether she was supportive and responsive, consistently unresponsive or rejecting, or inconsistently responsive), the child could gain useful information about their environment. Gaining information about their inherited unchanging environmental conditions early on in their life would be useful for the child to develop specific life-history strategies that were optimal for their survival and fitness (Belsky, 1997; Belsky et al., 1991; Chisholm, 1993, 1996, 1999). This can be considered as an interconnected chain of mechanisms serving the ultimate goal of promoting the child's fitness. That is, mother raised the child in a specific style that was responsive to the environmental conditions she was living in. Through this parenting style, the child gained information about the environmental conditions he/she was likely to be inheriting as environments remained relatively unchanged in ancestral past. Upon receiving such information about the environmental conditions, the child developed corresponding attachment style (in response to the parenting style reflective of the environmental conditions) that was adaptive and optimal to his/her survival and fitness. The attachment style so formed served as an internal working model to guide the child's resource management strategies. These resource management strategies would be suitable for the environment the child was living in and would continue to live in. Physical health and bodily energy are two of the most important internal resources in humans and management of external risks are critical to humans' safety and protection. Thus, attachment style should be involved in the guiding processes of managing and using these crucial internal and external resources.

Second, attachment, which is "turned on" early in life in response to parenting-mediated environmental conditions, is adaptive only when the

environmental conditions remain unchanged throughout adult life. This assumption was mostly true in the ancestral past but is largely untrue in contemporary urban living, where certain adult attachment styles have subsequently been found to be maladjusted (Brennan & Shaver, 1998; Mikulincer & Florian, 1998; Sroufe, Carlson, Levy, & Egeland, 1999). Another contemporary factor contributing to seeming mal-adaptation of attachment is that parenting may mediate contemporary issues other than resource and risk conditions that have been selected to calibrate attachment. For example, inconsistent parenting may be due to busy working or traveling schedule, divorce, or depression, all of which can be assumed to have been non-existent or far less common in ancestral past. In such instances, ambivalent attachment may be formed in otherwise high rather than low social economic families but is expected to continue to predict conservative rather than carefree resource and risk management styles. Attachment styles are evolved psychological mechanisms that served to promote reproductive fitness in ancestral past. However, contemporary life and environment are so fast-changing that they are very different from that in ancestral past. Hence, the ancestral fitness adaptation of attachment styles may no longer be recognized in modern times yet natural selection promoted psychological and developmental processes of attachment that were evolved to foster reproductive fitness in ancestral times to continue to operate today (Buss, 1995; Cosmides and Tooby, 1987).

Based on the evolutionary and life history models of human social development (Belsky, 1997; Belsky et al., 1991; Chisholm, 1993, 1996, 1999), the three core attachment patterns have the following characteristics and are theorized

to have evolved in response to environmental conditions and resource availability channeled through parenting practice to foster reproductive fitness:

Securely attached. In the EEA, consistent and responsive parenting most probably indicates the ability and willingness of parents to invest in the child, and stable availability of abundant resources and low environmental risk and/or a parental reproductive strategy that emphasizes high investment in relatively few high-quality offspring. Under such conditions, life history tradeoff of the child maximizes long-term learning or quality of development and delayed reproduction by continuing to extract rich resources from parents. Secure attachment is therefore an adaptation to a low-risk high-resource predictable environment in which survival is not an issue and maximizing growth and development is favored over early reproduction as better developmental quality enhances future reproductive potential and quality of offspring. As adults, securely attached is correlated with reasonable (not too high or too low) health concerns and health practices, buying, and risk taking. This is because consistent and responsive parenting conveys to the child that the environment is stable and predictable with abundant resources, and the future is likely to be promising. Secure attachment develops as an adaptive strategy to promote reproductive fitness in this kind of resource-abundant predictable environment by taking the future into account and make plans for it, and by investing resources and effort to long-term potentially better outcomes so that they can be funneled to future higher reproductive potential and quality. Secure individuals are likely to be concerned about their health and will put in reasonable amount of time and effort to maintain healthy status. They are willing to venture out and explore their environments by taking some risk and consuming at moderate level.

Avoidant. In the EEA, a mother's unresponsiveness or rejection may indicate her unwillingness to invest in the child or an extreme lack of resources or a hazardous environment where survival is at risk and/or a reproductive strategy at the time to allocate resources to other higher potential offspring or to mating rather than parenting effort. Under such conditions, the child's life history tradeoff must favor short-term survival strategy and resources must be devoted to immediate reproduction, e.g., avoiding infanticide, being self-sufficient, preparing for abandonment, over growth and development. Avoidant attachment is an adaptation to a high-risk and resource-depleting environment in which survival demands immediate attention. As adults, avoidant attachment is correlated with carefree (high to extremely high) monetary buying, risk taking, impulsivity, and lower to very low concern about health and the future. This is because in high risk and/or resource-depleted environment the optimal strategy is to allocate energy and effort to things that can have immediate return and consequences. Otherwise, uncertainties in such arduous environments may endanger survival, meaning that they may die before they live up to reproductive age. By being present-oriented, more willing to take risks, and not to spend extra time and effort on long-term health maintenance, they can ensure immediate payoff even though delayed rewards may be better as their survival can be at risk at any moment in such dangerous uncertain environments. Being future-oriented and careful may result in high potential loss due to long-term investment had their survival been at risk before they achieve reproductive success, the possibility of which is quite high in this kind of unpredictable environments.

Anxious/Ambivalent. In the EEA, inconsistent parenting may indicate a mother's inability to invest in her child due to resources shortage rather than

depletion and an overall unpredictable environment and/or a parental reproductive strategy that struggles to balance resources allocation among different offspring or between parenting and mating. The child's life history tradeoff favors early maturation and reproduction with a strong sensitivity to resources and continuous attempt to extract more investment from his/her underengaging mother. Since the child's mother is unable but willing to invest in her child, the child should try to extract as many resources, attention and time from the mother as he/she can. Growth and development is attended to through conservation either by conserving energy, avoiding risk and injury, limiting interests and activities or by extracting and hoarding resources. As an adaptation to limited resources and unstable environment, anxious preoccupation motivates early reproduction with an excessive and non-stopping effort to extract and conserve energy and resources. Survival is not an immediate challenge but early reproduction is favored over growth and development that relies on energy conservation and risk avoidance. As adults, ambivalent attachment is correlated with frugal and careful (low to extremely low) monetary buying and risk taking, and high sensitivity to bodily energy level. Since resources are still available but limited, rather than totally depleting, trying to extract and accumulate as many resources as they can would be an optimal resource management strategy so that these resources can be directed to earlier reproduction.

1.2 Purpose of the Present Study

This present study aims at investigating the relationship between attachment styles to primary caregivers and resource management strategies, and adopting an evolutionary approach based on life history theory of human social

development in explaining attachment as adaptive mechanism that a child develops early on in life in response to the environments or socioecology he/she is born into and inherits to promote fitness. In ancestral past environmental conditions remained mostly unchanged, so attachment styles as relatively stable internal working models develop to cope with the unchanging conditions of the environment. Given the importance of physical health and bodily energy as internal resources in humans and managing external risks as critical to humans' safety and protection, attachment styles should be involved in guiding the processes of managing and using these crucial internal and external resources.

Up to this point, although research looking at the relationship between attachment styles and reproductive strategies is rich, research examining the associations between attachment styles and important internal and external resource management strategies is scarce. Little is known about the relationships between attachment styles and management strategies of these critical internal and external resources. Thus, under an evolutionary framework, this present research attempts to fill this gap in the area by investigating the associations between different attachment styles and resource management strategies in terms of risk taking, buying tendency, health concerns and practices, and bodily energy level using multiple methods of study. Future orientation and impulsivity (both relevant to internal and external resources) will also be examined in this study since they are considered as two important strategies people employ to manage their resources. Findings in this area of research can have practical implications in applied and clinical psychology since knowing the patterns of people's attachment styles and resource management strategies can provide useful advance information as to whom and when promotion of preventive measures and

provision of supportive services may be necessary and/or effective should imbalance of these resource management strategies exist and create social problems.

Chapter 2: Literature Review

2.1 Attachment

Attachment Theory (Bowlby, 1969, 1973, 1980) proposed that human infants' motivation to seek proximity, comfort and security from their primary caregivers is innate. Their primary caregiver, mother in most cases, serve as their attachment figure. From an evolutionary perspective, this innate motivation is adaptive because in times of danger seeking security from and maintaining proximity to caregivers can help facilitate infants' survival.

Bowlby's increasing interest in a child's tie to the mother and the association between maternal deprivation and future personality development together with Ainsworth's interest in security theory set the stage for the establishment of attachment theory (Bretherton, 1992). Ainsworth proposed the idea that an attachment figure serve as a secure base for the infant to explore the world. Extending from Bowlby's work, Ainsworth designed the Strange Situation and observed infants of around one-year-old. From her observations, there were three major patterns of infant attachment. In the Strange Situation, infants who had secure attachment explored freely in the presence of their mother. They became upset when their mother left them but were happy when reunited with their mother. Infants who were anxious-resistant became distressed when their mother left them and did not explore even in the presence of their mother. When their mother returned, they wanted contact with her but would get angry and hit or kicked their mother. Anxious-avoidant infants showed little emotion when their mother left them or reunited with them. When their mother came back, they avoided their mother if she tried to approach or picked them up. They did not explore whether their mother was present or absent in the room. Ainsworth also

discovered that those infants who were avoidant or anxious toward their mother upon reunion in the Strange Situation exhibited less harmonious relationship with their mother at home when compared to those who were securely attached to their mother upon reunion (Ainsworth et al., 1978). The joint effort and contributions of Bowlby and Ainsworth had laid the foundation for the development of attachment theory.

According to attachment theory, particular kind of attachment style with attachment figure is formed during infancy depending on the availability and responsiveness of the attachment figure in times of danger and need. For instance, if attachment figures are responsive and reliable to the infants' needs, secure attachment orientation is likely to develop. However, individuals will likely develop avoidant attachment style if their attachment figures are rejecting or consistently unavailable. If attachment figures are undependable or unpredictably responsive when they are needed, infant will likely develop anxious attachment style.

Attachment styles are internalized responses to child rearing practice. Collins and Read (1990) believed that people with different attachment styles hold different beliefs about themselves and others. They hold different beliefs about the extent to which their attachment figures can be relied on, e.g., the availability of their caregivers when they were young and the availability of their partners when they became adults. The working models of these different attachment styles can be thought of as part of an individual's personality (Mikulincer & Shaver, 2007) which are consistent across time and will guide people's feelings, attitudes, thoughts, and behaviors (Hazan & Shaver, 1994a). Hazan and Shaver (1987) found that the different attachment styles developed during infancy

manifest themselves in the ways adults interacted with and related to their romantic partners in adult romantic relationships. Besides, the working models are believed to be transferable across relationships. For example, attachment styles to mother during infancy were found to be a good predictor of peer functioning from preschool to adolescence. Such early attachment styles were shown to be strongly related to relationship satisfaction at age 21 since individual's working model formed during infancy served as a framework for relating to others and prepared the individual to get into the social world (Sroufe, Egeland, and Carlson, 1999; Sroufe, Egeland, Carlson, & Collins, 2005). These findings supported the transference nature of the internal working models, not only across time, but also across relationships at different levels. Attachment orientations once formed remain relatively stable throughout the life span and across relationships although it is possible for modification in some cases (Simpson & Rholes, 2004).

Attachment orientations in adults can be measured on two orthogonal dimensions, i.e., avoidance and anxiety (Brennan, Clark, & Shaver,1998; Simpson, Rholes, &Phillips, 1996). Anxiously attached individuals are likely to have lower self-esteem and feel that they are not being understood and appreciated. They think of others (especially their close others) as unwilling or unable to commit to long-term relationships and over-interpret situations as irreversible, uncontrollable and threatening (Collins & Read, 1990; Mikulincer, 1995; Shaver & Hazan, 1993). Alternatively, avoidantly attached individuals are likely to be aloof, cynical, and emotionally distant. They see others as untrustworthy and too ready to make long-term commitments to relationships (Mikelincer & Florian, 1998), and they devaluate the importance of relationships by minimizing their investment in their

relationships (Tolmacz, 2004). Individuals with low scores on both the anxious and avoidant dimensions are considered as securely attached. These individuals are more likely to have satisfying and stable relationships, have higher levels of self-disclosure and trust, and higher self-esteem than individuals with insecure attachment styles (Collins & Read, 1990; Shaver & Hazan, 1993; Simpson, 1990).

Research has shown that both early and adult attachment styles are related to a wide range of outcome variables across individuals' lifespan. These include developmental, social and interpersonal relationships. Early attachment to mother has been shown to be strongly related to social competence, peer relationships and scholastic skills (Sroufe, Egeland & Carlson, 1999; Jacobsen & Hofmann, 1997). Simpson, Collins, Tran, and Haydon (2007) revealed that early attachment was significantly associated with social competence. In their study, children who were securely attached at 12 months old were rated by their teachers during early elementary school years as more socially competent. The high social competence of these securely attached individuals fostered their skills at conflict resolution and collaboration, thereby strengthening their relationships with peers. It is therefore believed that attachment security often influences peer relationships through the working models we carry with us from childhood (Bowlby, 1969, 1973, 1980). Positive relationships with peers can act as a protective factor. Such positivity can help alleviate distress, increase school engagement and school interest, thereby promoting better academic performance (Wentzel, 1998). Waters and Cummings (2000) contended that children's high quality of relational ties to peers and confidence in relationships serve as a secure base for them to explore away and be able to successfully master school environments.

Early attachment to mother can affect children's performance in school as well as teachers' perception of the children in class. In a study by Pianta, Nimetz, and Bennett (1997), teachers of four-year-old securely attached children rated them as more academically competent and as having fewer behavioral problems in the classroom. On the other hand, children who were insecurely attached to their mothers were rated by their teachers as less likable (Cohn, 1990). In addition, DeMulder, Denham, Schmidt, and Mitchell (2000) suggested that children who were less secure showed more anger and aggression toward their peers and teachers in school. This behavioral style could have an impact on children's motivation to do well in school, thus, affecting their academic performance.

The effect of secure attachment on academic achievement carries over time. As Jacobsen and Hofmann (1997) reported, securely attached seven-year-old children had better cognitive performance and were found to have higher GPAs throughout adolescence when compared to their insecurely attached counterparts. Moreover, positive academic performance can be influenced by positive peer relationships while lacking such positive relationships can possibly lead to interpersonal problems, distract the children from their studies and so undermine their academic performance (Furrer & Skinner, 2003).

In terms of adult attachment, previous research on peer and romantic relationships has consistently shown that attachment styles and relationship quality were closely related. People who were securely attached reported being more satisfied with their relationships while insecurely attached individuals were involved in less happy relationships characterized by greater interpersonal difficulties (Carnelley, Pietromonaco, & Jaffe, 1994; Feeney, 1999). It is believed that relationship quality affects highly avoidant and highly anxious people in

different ways even though insecurely attached individuals both reported their relationships as less satisfying and lower in quality. Highly anxious people often ruminate and worry about being abandoned by their partners and so they constantly seek proximity to and reassurance from their partners. Highly avoidant people, by comparison, frequently attempt to distant themselves from their partners psychologically and emotionally, and they devalue the importance of intimacy and closeness in relationships (Tolmacz, 2004). People's willingness to compromise their ideal standards when choosing their mates varied across different attachment styles (Tolmacz (2004). In order to minimize the risk of being hurt in a relationship, individuals with an avoidant attachment style were more flexible in compromising their ideal standards of their partners because they tended to devaluate the importance of relationships. In contrast, since anxiously attached individuals were more likely to over-interpret situations as threatening yet they would hope for their partners to provide them with support, these individuals would (compared to avoidant individuals) be more rigid about the ideal standards they set for their partners in order to avoid the risk of being hurt. Besides, attachment orientations have impact on people's perception of the self and others through the different working models they harbor (Collins & Allard, 2001). For instance, attachment styles can influence people's subjective perception of beneficent behaviors exhibited by interaction partners. Given the same level of beneficent behaviors performed, highly avoidant people may see them as superfluous whereas highly anxious people may perceive them as insufficient, thus, affecting their satisfaction with their relationships. Thus, attachment styles form early on in a child's life can have huge impact on his/her future behaviors and relationships throughout the lifespan.

Although attachment theory has been widely-studied and well-received in psychology, it is not without criticisms and limitations. Some of the major criticisms of attachment theory concern the singularity vs. multiplicity of attachments. As pointed by Lewis (1994) individuals formed multiple attachments with different people and that a single attachment to mother cannot fully handle and explain the complexity of human needs and relationships from infancy to adulthood. One can have secure attachment with one figure while insecurely attached with another. By having multiple attachments that are not the same across relationships, attachment is not likely to be a trait. This further suggests that factors such as the multiple needs, the environment, and relationship context of the individual should be taken into account.

Another criticism of attachment theory involves the overemphasis of stability in attachment relationships. Although there were results from longitudinal studies showing that differences in individuals' attachment security was stable across the lifespan, researchers also found that attachment styles could be subjected to revision in relation to experience (Waters et al., 2000). In the prototype approach to continuity of attachment style, researchers suggested that throughout development the working model prototype formed during infancy can be revised in correspondence to the changing social circumstances and other factors while current attachment experiences can further update an individual's attachment representations (Owens et al., 1995; van IJzendoorn, 1995). Summary of results from studies of infant attachment classifications by Campos et al. (1983) were mixed with the conclusion that the stability of attachment classifications over time was only modest. Other studies showed that infants changed their attachment classifications from one to another, showing the malleability of

attachment relationships (Egeland & Farber, 1984). Besides, at maturation the position of the attachment hierarchy of parental figures who usually served as a child's primary attachment figures could be changed or adjusted. When a person forms adult pair bonding with a romantic partner, the partner becomes his/her primary attachment figure and takes priority in the attachment hierarchy (Hazan & Shaver, 1994b).

2.1.1 *Bowlby, Evolution and Attachment Theory*

Bowlby (1969, 1973, 1980) believed that since humans had shared many of the physiological and anatomical features with other species, it was probable that we also shared some of the behavioral features in other species. Therefore, he adopted the ethological approach of studying behaviors through observations in natural settings. Indeed his attachment theory was derived from the work of ethologists and was particularly influenced by the work of Lorenz (1935) on imprinting. As Ainsworth (1962) commented, one of the major important contributions of Bowlby's work was his insightful understanding of the relevance of ethological theory and methodology for studying human social development, and integrating this ethological approach to reframe psychoanalytic theory and providing testable framework. Lorenz discovered that early on in their life birds developed strong bonds to a mother-figure. He later conducted experiments to study goslings and ducklings and found that they developed attachment behavior with the first moving object (attachment figure) they saw shortly after they were hatched, even without any reference to food. The attachment figure could be their mother bird, a human, or any objects. They not only followed that particular moving object, but also preferred that object to others and would only follow that

object after some time. This intriguing finding had led Bowlby to realize that the formation of social bond did not necessarily have to be tied to feeding. So he formulated and tested his ideas about the development of human children's bonding to their mother in an ethological framework and proposed the important theory of attachment.

When Bowlby (1969, 1973, 1980) first proposed the attachment theory, he made an underlying assumption that human infants have an innate motivation to form attachment with their caregivers (usually their mothers). Bowlby believed that humans are just like other animals, our need to form strong affectional bonds with a caregiver (known as attachment behavior) is innate. He asserted that attachment behavior is instinctive and is the product of early environment and genetic interaction. Humans have an urge and tendency to seek and maintain proximity to particular others, often referred to as the attachment figures. Such tendency has adaptive advantage because by forming attachment with their attachment figure, infants' chances of survival are enhanced through proximity with their mother, protection from predators, food provision, shelter, care, warmth and stimulation.

Based on evolutionary theory, Bowlby proposed the concept of environment of evolutionary adaptedness (EEA) as one of the central arguments in his tri-volumes of *Attachment and Loss*. He advised that in order to understand human behaviors, especially instinctive behaviors, one has to take into account the natural adaptedness of humans. In hunter-gather societies, ground-living species such as humans usually lived in social groups that remained relatively stable across the life span. Since almost all species have to cohabit with other species, many of which are potential predators, species have to be equipped with

behavioral systems that help with protection and survival. In the case of humans when predators appear and are threatening, living in social groups lowers the chances of being killed by predators. This is because strong, mature members of the group join together to fend off the predators and the weaker and immature members of the group (such as females and children) take retreat. Being alone without any accompany makes it easy and likely to be preyed on as victim. Therefore, in man's environment of evolutionary adaptedness, immature and helpless as human infants should have likely evolved traits that could promote protection and thus, survival. Attachment to mother in humans is an example of instinctive behavior that has evolved in the EEA and operates to enhance humans' chances of survival. Such behavioral system has been working to promote the fitness of species within the social and physical environment they inherit.

As can be seen from Bowlby's line of work, ethology and evolutionary theory served as the basis of his attachment theory.

2.1.2 *Attachment from an Evolutionary Perspective*

In ancestral past, humans mostly lived in consistent environments in which changes in the physical and social environments were not likely. People stayed in the same area, bound with small cooperative groups for their entire life and across generations. Therefore, the way a caregiver responded to and acted upon the environmental conditions served as useful information about the conditions of the environment that an infant was likely to inherit in the future. In other words, the mothers played the role of a mediator between the environment and their offspring, from whom the infants learned about what conditions they were going to face and deal with in the future. Different attachment styles are optimal strategies

responding to specific environments in which individuals live and develop in order to improve their fitness. Accompanied by tradeoffs, these optimal strategies are coevolved traits most suitable to increasing fitness in specific environments (Simpson & Belsky, 2008).

Formation of attachment styles depends on the child rearing patterns adopted by caregivers (mothers in most cases). Such rearing patterns carry in them important information which is a reflection of the general environment in which families inhabit because mothers act as a filter and mediator of the demands and impact from the living environment (Levine, 1980). Infants' mothers who need to be dealing with survival demands usually experience high level of stressors. In an experiment by Rosenblum and Paully (1984), rhesus monkeys that were in the resources deprivation condition were less attentive to their children's needs. Furthermore, results indicated that mothers with high contextual stressors were more likely to be rejecting, unpredictable, insensitive, and using inconsistent parental disciplinary practices (Belsky, 1984; Burgess & Draper, 1989). In fact, inconsistent parental discipline was found to have mediated the effect of family economic hardship and delinquency in adolescence (Lempers et al., 1989). These parenting styles activated by the environmental distress experienced by mothers are likely to induce insecure attachment styles in infants and children. Therefore, from an evolutionary perspective, early experience from infancy to childhood not only shapes the mental working models of the self and others, but also signals to the child the predictability and availability of environmental resources (Belsky et al., 1991).

The way parents connect with their children through parenting can be seen as one of the strategies parents use in reaction to the environmental conditions

parents are involved in and their children are likely to inherit. Infants are too young and lack the ability to directly assess the stability of their physical (e.g., level of resources available in the environment, be it plentiful or harsh, safe or unsafe) and social (e.g., bonding and emotional states of the parents, availability of paternal investment, and other forms of social support) ecology. Therefore, styles of parenting manifested in parents' attentiveness, sensitivity and responsiveness to their children's needs serve as a useful and reliable hint of the environment as well as of the bonding of the parents for these infants, thus, shaping the infants' attachment styles to their mothers (Belsky,1997; Belsky et al., 1991; Chisholm, 1993, 1996, 1999). Mothers, who are the primary caregivers in most cultures across time, can be considered as a living filter for infants to gain information about their environment.

Belsky et al. (1991) and Chisholm (1993, 1996, 1999) are some of the pioneers who have extended Bowlby's attachment theory using an evolutionary approach, and integrated life-history theory in the study of the impact of environmental factors on human development and later resources allocation strategies such as reproductive strategies.

Belsky et al. (1991) proposed in their lifespan model of human social development based on evolution that early social experience serves the evolutionary function of preparing children for the environments they are likely to inherit. More specifically, they suggested that early contextual factors such as amount and level of stress (financial and relational) in the family will affect parenting styles, shaping the attachment patterns of children and then influence their sexual maturation rate which later contribute to specific reproductive strategies. Individuals with secure attachment style will (unconsciously) opt for a

delayed maturity, future reproductive strategy. These securely attached individuals will tend to have a delayed onset of maturation and started their sexual activity at a later time. They prefer to have long-term relationship and will put in high level of parental investment on their offspring. On the other hand, when compared with the securely attached, individuals with insecure attachment styles will select an early maturity, current reproductive strategy in which the onset of puberty will be earlier. These insecurely attached individuals will tend to start their sexual activity early, seek short-term pair bondings, and provide low level of parental investment (Belsky, 2007). Evidence from abused and neglected children research showed that insecure attachment styles induced by inconsistent rearing practice were associated with behaviors in opportunistic ways and untrusting attitudes toward relationships and the world in general (Youngblade & Belsky, 1990). In their study and many that followed, results showed that early rearing practices had an effect on the timing of puberty and reproductive strategies (Belsky, 2007; Chisholm et al., 2005; Ellis, 2004). For example, Chisholm and colleagues found that total early stress ("up to about ten years old") experienced by participants who were assessed while they were pregnant correlated highly with age at first birth, expected lifespan, age at menarche, and adult attachment. The participants who were exposed to high level of early stress such as family violence or parents' divorce were more likely to have insecure attachment styles, experience menarche and give birth to their first child at a younger age, and have shorter expected lifespan. From these findings, the researchers suggested that early stress serves as an indicator of environmental uncertainty and risk which activates the insecure attachment pattern as an adaptive mechanism and strategy to

maximize current reproduction (Belsky et al., 1991) with early age at menarche and first birth as preconditions for reproduction to be successful.

Building on Belsky et al.'s (1991) model, Chisholm (1993, 1996) theorized that in the environment of evolutionary adaptedness (EEA) mortality rates (a form of early stress indicating environmental risk and uncertainty) were important indicators of environmental viability and difficulty, and should therefore affect childrearing practice which then influenced individuals' developmental and reproductive pathways. For instance, when local mortality rates were high, the environments were likely to be harsh and dangerous, resulting in insensitive and indifferent parental care. Such insensitivity in parenting practice conveyed to the children that the environments were difficult and mortality was high, prompting children to develop insecure attachment styles that would be more suitable to increase fitness in such difficult environments (Chisholm, 1993, 1996). On the other hand, when mortality rates were low, the environments were likely to be stable and safe, parents in this condition were able to deliver more sensitive and better caregiving to their children. As a result, children were likely to develop secure attachment style that would increase fitness in hospitable environments. Besides, Chisholm (1999) further proposed time preference (the tendency of an individual to prefer immediate versus future rewards or gratification) as another psychological factor that was associated with childhood experience and reproductive strategies. That is, early environmental risk and uncertainty would affect individuals' differences in time preference and their attachment organizations which would then influence their reproductive strategies. In his study Chisholm reported that participants who had experienced more early stress before ten years old were more likely to have insecure

attachment styles, shorter time preference, and opt for current rather than future reproduction. Such strategies, be it conscious or unconscious, are adaptive in an uncertain, high stress environment because it would be unwise for individuals living in high risk environments to prefer delayed payoffs instead of immediate ones as these individuals might not live to have descendants had they waited too long to mate and reproduce. This would jeopardize their fitness (Daly & Wilson, 2005).

As Burgess and Draper (1989) suggested, ecological instability (e.g., family ecological stress such as poverty and divorce) can act as macro-indicators affecting micro-level processes and personal traits (e.g., deviant attributes such as depression and anxiety, or personal attributes such as attachment and parenting styles) which in turn influence attitudes and behaviors (e.g., violence in families, risk-taking tendency, and resource management strategies). These researchers theorized that sensitivity to changes in the availability of resources in the environment is adaptive and parenting behavior ought to be particularly sensitive to the cues of the level of stability in the ecology as this behavior is pertinent to fitness. Based on this biosocial theory, parenting and attachment styles should be appropriate candidates for the indicator roles of environmental conditions and stability.

2.2 Life History

Variations in life history traits and tradeoffs have driven species into different developmental trajectories, resulting in specific differentiation of life patterns, characteristics, and development between species as well as within species. Species development is largely defined by life history traits and tradeoffs. Special human traits and tradeoffs make humans different from other animals and mammalian species.

2.2.1 *Life History Theory and Evolution*

Resources available to an individual are limited, so is the energy one can allocate to particular activities across his/her lifespan. Resources and energy allocated to one activity are not available for another. Such competition for energy and resources among different endeavors or traits results in a whole array of tradeoffs across the lifespan (Ellis, 2004; Stearns, 1992). Fitness (reproductive success) is measured in relative term to that of other individuals within a population and selection will favor traits that are associated with higher fitness. Mechanisms for organisms to strategically allocate limited resources and energy to growth and development, maintenance, reproduction, raising offspring to independence, and survival will be favored by selection because these are the major components of fitness and maximizing fitness is the ultimate goal. As a result, there is a constant battle among these traits in order to achieve the best possible outcome with what is possible and available under the socioecology of the organisms.

2.2.2 *Evolution of Human Life History Traits*

About two to three million years ago human ancestors evolved to become bipedal which resulted in the narrowing of the female pelvis but at the same time human developed a larger brain size. Due to the constraints brought about by bipedalism and the evolved large brain, human infants have to be born altricially in order for the infant's head to pass through the narrowed birth canal. This makes them fully dependent on their parents and require a prolonged childhood and adolescence to grow, develop and mature. After birth the human brain continues to grow rapidly. Such helplessness of human infants has most likely led to the changes in social relationships and parental behavior, and resulted in a unique pattern of development in humans (Rosenberg & Trevanthan, 2002).

Some models on the evolution of human bipedalism suggested that walking on two legs raised the head, allowing for better detection of predators and preys with increased visual field. This was efficient for travelling long distances and allowed humans to free our hands to carry food and for tool and weapon use as well as to hold and carry the infants (Hewes, 1961; Lovejoy, 1981; Tanner, 1981). This last factor has led to the proposition that by being able to hold infants close to the mother's face and body, attachment to mother evolved. This series of changes and evolution of human bipedalism, significant increase in brain size thus the adaptation of premature birth, helplessness of the infants, and their high dependency on care provision have made parental care indispensable. In fact, the extensive care needed by such helpless infants for an extended period of time is something more than a single mother can provide. Therefore, additional help from the father and other family members such as grandparents and siblings is necessary in order to enhance survival and reproductive success of offspring (Flinn, Quinlan, Coe, & Ward, 2007).

2.2.3 *Prolonged Childhood and Juvenile Period*

An extension of the childhood and juvenile period for the development of a large brain substantially delays maturity and reproduction in humans. The general human life history traits of large brain and bipedalism put infants into an extremely helpless state and require a prolonged childhood and juvenile period. Although variations in terms of life history strategies exist within the human species depending on socioecological contexts, the series of general human life history traits lead to the tradeoffs of future over current reproduction and necessitate high parenting effort from both the mother and the father as well as from other members in the family. In order to enhance offspring's chances of survival and reproductive value, favoring quality over quantity of the offspring may be more adaptive for the slow developing human species. As can be seen, these unique human life history traits and tradeoffs are interconnected in a way that defines human development patterns, an overall K strategy (K strategy involves high parental investment in a small number of offspring; r strategy involves low parental investment in a large number of offspring). There must be selective advantage to the development of a large brain and related traits in the human life history tradeoffs such as prolonged childhood despite the huge cost associated with them (i.e., delay reproduction and fewer number of offspring), otherwise, these life history traits would not have evolved.

The development of a large human brain has provided us and our ancestors with unique abilities, thus, advantage to survive socially complex challenges. These include capacities for information processing, language, theory of mind, and sociality (Amodio & Frith, 2006; Kaplan & Robson, 2002; Pinker, 1994). All

these capacities enable complex learning to take place, preparing children to be both physically and psychologically competent for living in a challenging environment (Bjorklund & Bering, 2003). Besides selection between species, selection pressure arising from within species competing over resources is keen. Indeed intra-species competition in humans seems to be even more critical than that in other species. The unique human mental capacities such as intelligence, language, sociality and theory of mind are proposed to be functioning as important adaptations for negotiation in social relationship which may involve social coalitions and dominance (Alexander, 1989; Flinn, Geary, & Ward, 2005). Possession of these unique human abilities is made possible by the evolution of a large brain and an extended childhood. Even though the large human brain and mental capacities require a long time to develop which favor future over current reproduction, chances of survival and reproductive success are likely to be enhanced as these traits allow humans to be better prepared for life challenges.

2.2.4 *Life History Traits and the Environment*

During the first few years of our life our early experience informs us about our environment (e.g., resources availability and predictability), the people and interpersonal relationships around us. All this information will influence the developmental pathway through which a developing person allocates his/her reproductive effort to enhance fitness (Belsky et al., 1991). If the rearing environment of children is stable with resources steadily available and their childhood experience guides them to perceive others as reliable and relationships as long-lasting, secure attachment is likely to form. In addition, their onset of puberty and sexual activity will be delayed, they are more likely to develop and

maintain enduring pair bonds. These people will put in more effort into parenting than to mating – a quality approach to reproduction. On the other hand, early stressful experiences, unpredictable and/or limited or depleted resources, unreliable people as well as opportunistic interpersonal relationships around the child will lead to early maturation and sexual activity, unstable pair bonds and limited investment in parenting, i.e., a quantity approach to reproduction. In sum, high level of stress in a child's environment will likely trigger an earlier onset of reproduction, low levels of parental investment and facilitate a quantity over quality approach to reproduction when the child grows up.

Chisholm (1993) further hypothesized that parents' behavior and the way they connect with their children (the attachment process) are affected by the correlates and causes of local mortality rates. During their development, children are influenced by the effects these mortality causes and correlates have on their parents through the attachment process which then activate a "switch" for entraining an adaptive strategy to deal with their adaptive problems. So the attachment process is regarded as the psychobiological mechanism for optimizing life history tradeoffs, especially the current vs. future reproduction tradeoff. Chisholm argued that reproductive strategy of early reproduction and high reproductive rate may be activated by early stress because such stress is an indicator of environmental uncertainty and risk. Based on this assumption, it was predicted that when mortality risk was high, women would have earlier menarche since early menarche promotes early reproduction, a current over future reproduction approach to reproductive success.

There is research evidence supporting the hypotheses of these aforementioned models, showing that early experiences may be a good candidate

in shaping the optimal tradeoffs in reproduction. When parents experienced economic hardship in their family or high stress in their environment, they tended to be more rejecting, unpredictable, insensitive, and inconsistent in their parental disciplinary practice; their children were also more likely to be delinquent (Belsky, 1984; Burgess & Draper, 1989; Lempers et al., 1989). Early stress was found to have mediated the attachment process and the development of reproductive strategies (Chisholm, 1999), and was related to earlier menarche and first birth (Chisholm et al., 2005) as early menarche facilitated early reproduction and maximized current reproduction.

These models share a common idea, i.e., in risky or unpredictable environments where there are depletion or uncertain availability of resources and high mortality risk, parents most likely do not have enough resources to provide for their offspring. Even if they can afford to invest in their children, parental investments do not have much effect on increasing offspring's survival and reproductive value in high risk environments. Under these conditions the optimal tradeoffs will be the short-term reproductive strategy of producing offspring in large quantity or at high rates and as early as possible. Parental investment in offspring will be minimal yet maximizing current reproduction will increase the probability of having at least some offspring to survive into reproduction despite their relative low quality. Therefore, the reproductive strategy, be it short-term or long-term, can be equally adaptive depending on the conditions of local ecology.

In spite of the general preferences in life history tradeoffs in humans, that is, slow development, delay maturity and reproduction, few high quality offspring and high parental investment, there are factors that would make this pattern of strategies and tradeoffs not favorable. As Quinlan (2007) proposed, parental

investment has a saturation point which is associated with hazards in the environment. Evidence from cross-cultural studies revealed that as level of pathogen stress increased to moderate, maternal investment increased. When extrinsic risks such as pathogen stress, famine and warfare were high, parental effort decreased. This is because in high risk environments parental investment does not make much of a difference in the survival and reproductive success of their offspring and child outcomes are dependent on chance. As a result, fitness would be enhanced by devoting effort into mating or by producing higher quantity of offspring instead of into parenting when risk is high. In contrast, when extrinsic risk is low, parental investment can improve offspring's chances of survival and reproductive success in the future. So environmental hazards have an impact on the tradeoffs between quality and quantity of offspring, current and future reproduction, as well as between parenting and mating effort.

The unique human traits and life history tradeoffs have made humans as a whole a highly K-selected species (Rushton, 1985). Species exercising the K strategies usually live in a stable, predictable environment, and follow a slow trajectory to development. Resources are allocated to growth and development over reproduction, have a long childhood and delay maturity, produce a few number of offspring with higher quality to survive to reproductive age, devote high parenting effort to their offspring over mating, pursue long term relationships and are selective in mate choices. One the other hand, species that are highly r-selected reach sexual maturity early and reproduce in large quantity but of lower quality, employ short term mating strategies with effort devoted to mating rather than parenting, and provide no or minimal level of parental care to their offspring. In conditions where the environments are unstable and unpredictable r-selection

tends to be more prominent, while K-selection is more favorable in stable and predictable environments (Pianka, 1970).

Although some species adopt one strategy over the other resulting in between species differences, within species variations also exist due to the environmental conditions individuals are exposed to. In K-selection, life history tradeoffs tend to favor development and growth over early reproduction, high quality and more competitive offspring over a large quantity of offspring, high parental investment over investment in mating. In humans there are considerable individual variations in our life history strategies (Rushton, 1985). Whether a strategy is optimal depends not only on the life history traits of a particular species but also on the environmental circumstances that species is in. Even though humans are on the whole K-selected, when living in unpredictable and unstable environments, selection would not favor K strategies of delay reproduction, slow maturation, producing few offspring of high quality and high investment in parental care because mortality risks are high. Even putting in high level of parental investment in a few high quality offspring does not increase offspring's likelihood of survival and reproduction. In unpredictable and unstable environments, the r strategies of reproducing early and producing a large quantity of offspring would be adaptive since chances are that reproducing early results in a larger number of viable offspring and at least some of these offspring will survive to reproduce. Eventually individuals who exercise r strategies in unstable and unpredictable environments will outcompete those who adopt K strategies. Conversely, in predictable and stable environments extrinsic risks are low, selection will favor individuals who delay their maturation and reproduction, and provide high levels of parental investment in a few high quality offspring because

these K strategies will facilitate the competitiveness of these high quality offspring to survive and reproduce.

For instance, the environmental context of a child is relatively unpredictable and unstable without the presence of the father to provide care and protection. In families which the father was absent, children's social status was lower and mortality rates were higher (Geary, 2005). Children growing up in a father-absent family will be more likely to employ r strategies. Results from Ellis' (2004) comprehensive review showed that girls from father-absent families and girls who were exposed to genetically unrelated male in a family for a long time experienced menarche at an earlier age, lending support to the idea that an unpredictable and unstable environment is related to an earlier onset of maturity.

Although humans are K-selected in general (Rushton, 1985), the socioecological contexts of individuals vary widely. Consequently, there is no one particular life history strategy that works for everyone. Even within the human population, life history strategies can range from low-K to high-K in response to the socioecological condition of each individual. From an evolutionary perspective, no one particular strategy is superior to the other and environmental contexts have to be taken into account. Selection will favor certain life history traits and strategies as adaptive depending on the socioecological situations individuals experience.

Life history evolution has been and still is operating in the best possible fashion in humans and other organisms at every level throughout the developmental cycle. By taking into account the contingencies of the local environment, life history evolution helps us to gauge our strategies in maximizing our fitness by surviving into reproductive age and reproduce. The unique human

life history traits and tradeoffs of bipedialism, large brain, prolonged childhood and juvenile period which likely favor parenting effort over mating effort, quality over quantity of offspring, and late over early reproduction, have defined the characteristics of human development different from other animals and mammals, making human race remain as one of the most successful species on earth. Furthermore, within species variations in these human life history traits and strategies in response to individual's socioecological contexts promote survival and fitness in individuals living in a variety of environmental niches. These life history tradeoffs and strategies in survival and reproduction evolved corresponding to the different environmental conditions individuals are facing and could result in different parenting practice. From the style of parenting a child receives information about the environment and the optimal attachment style is then turned on in response to the information received.

2.3 Attachment and Resource Management Strategies

Attachment in infants is adaptive not merely because it promotes survival through resource acquisition such as food, protection, proximity and comfort from attachment figures but also because attachment between infants and their mothers will ultimately enhance their inclusive fitness, i.e., increasing their chances of reproducing offspring to live to reproduction in the future (Gubernick, 1981). Therefore, attachment style serves as an adaptive mechanism to enhance chances of survival and fitness. In ancestral past, if caregivers were sensitive and responsive to their children's needs, the environment they were living in was likely to be safe and resource-sufficient so that they could devote their time and energy to parental care. Conversely, if the caregivers were insensitive and irresponsive to the needs of their children, they were likely an indicator of an unstable or dangerous environment, with few resources available (Simpson & Belsky, 2008). Based on the hypotheses drawn from evolutionary and life history theories of human social development (Belsky, 1997; Belsky et al., 1991; Chisholm, 1993, 1996, 1999) attachment styles established in different environmental conditions in the EEA would have particular characteristics.

Children developed secure attachment style in response to their caregivers' supportive and sensitive parenting practice which was likely an indicator of a resource-abundant low risk environment in ancestral past. Such caring and supportive parenting practice promoted in the children a working model and belief that the environment was safe, others could be trusted, and relationships were long-lasting (Belsky et al., 1991). As a result, securely attached individuals were likely to take on a quality over quantity strategy in parenting and mating. Secure individuals were found to be responsive and supportive partners and parents when

they reached adulthood. Compared to insecure individuals, secure individuals were found to have more supportive and positive interactions with their partners, they reported having few relational conflicts and were more effective in managing conflicts in their relationships (Kobak & Hazan, 1991). Moreover, secure individuals had romantic relationships that last longer, more stable and more satisfying (Hazan & Shaver, 1987; Kirkpatrick & Davis, 1994). Their children were also found to have developed secure attachment with their secure parents (van IJzendoorn, 1995) probably because secure parents were more responsive and supporting in their parenting styles and tended to invest highly on parental care.

In a resource-limited and unpredictable environment, parenting practice was likely to be inconsistent activating an anxious attachment style in the child. In order to adapt to the unstable resource-limited environment, these individuals ought to be sensitive to the level of resources should they be available and attempt to extract and conserve these resources for themselves.

In a high-risk resource-depleted environment, parenting style was likely to be unresponsive or even rejecting. This triggered an avoidant attachment style in the child as a way to deal with the harshness in the environment. Due to the danger and uncertainty in the environment, survival would be at stake at any point in time and the future was not something one could expect for. Short-term survival and reproductive strategies typified by high impulsivity, high risk taking and low concern for health and the future would be optimal for individuals living in this kind of socioecology.

Due to limited resources available and energy an individual can devote, issues of survival, development, and reproduction are of recurrent concern across

a person's life span. Strategies of resources allocation (i.e., resources management strategies) to survival, development, and growth (somatic effort) or to mating and parenting (reproductive effort) can facilitate reproductive success depending on the predictability of risk associated with and resources available in the environment in which an individual inhabits (Belsky et al., 1991; Chisholm, 1993; Del Giudice, 2009).

In a study by Vergara et al. (2010) on kestrels, researchers found that the quality of the parents and environmental circumstances such as level of food supply had significant effects on the postfledging dependence period of kestrels, with better quality parents and food supplementation during fledging increased the postfledging dependence period of kestrels significantly. These researchers proposed that food supply could be a driving force of the quality of parents and the duration of the postfledging dependence period in kestrels, with high quality parents investing more and longer in parental care for broods with higher reproductive value (Clutton-Brock 1991; Vergara et al., 2010). Another example was that when food supply was poor, the larger-sized female chicks in the all-female broods had lower haematocrit values (a measure of nutritional condition and health state in birds) compared to female chicks in mixed-sex broods. This showed that parental effort or lack thereof in response to food supply conditions could affect the health or even survival success of their offspring – that is, when parental effort in regard to sex ratio of their brood was not altered especially during food shortage, the larger sex offspring may suffer (Laaksonen et al., 2004).

According to life history and the attachment theory model of the development of reproductive strategies proposed by Belsky et al. (1991), environmental risk and unpredictability are potential factors that are likely to

affect the optimal tradeoff between current and future reproductive strategies. Consistent with these theories, studies have shown that environmental uncertainty and risks indexed by early stress were associated with adult attachment and differences in individual's time preference (Chisholm, 1999). Based on the characteristics of different attachment strategies triggered by parenting styles in response to environmental conditions and the potential contributions of resource management strategies in buying tendency, future orientation, risk propensity and risk taking, impulsivity, health concerns and practice as well as bodily energy to human fitness, attachment styles ought to be associated with such resource management strategies. Thus, we now turn to these relevant resource management strategies.

Impulsivity and Impulsive Buying Tendency

People who are impulsive incline to behave without much forethought. These individuals are quick in their action and they do not take the future into consideration. Impulsivity is related to risk taking and delay gratification (Whiteside & Lynam, 2001).

According to Dickman (1990), impulsivity can be functional or dysfunctional. Impulsivity can bring in negative consequences and if taken to an extreme, it can become pathological (e.g., substance abuse and pathological gambling). However, impulsivity can bring in positive or favorable outcomes. For instance, acting impulsively and rapidly can increase the speed of information processing. It helps to save time and effort in some circumstances. In a study by Dickman, individuals who were functionally impulsive were able to process information rapidly and performed better in cognitive tasks. They were more adventuresome and enthusiastic.

The way people make purchases reflects part of their strategies in managing their resources. Material resources purchased can sometimes be used to signal status and power in society. According to Etzioni (1986), when people make their purchases, they do not follow economic principles to buy rationally and they often do not purchase strictly because the products are necessary. Impulsive buying involves purchases that are not planned for and are usually initiated on the spur of the moment, resulting in purchasing items that are not needed. Impulsive buying as an irrational buying impulse was found to be associated with individual characteristics such as high level of extraversion and low levels of autonomy, conscientiousness, and need for structure. These individuals were likely to be lack of planning and act on immediate impulse (Verplanken & Herabadi, 2001).

Impulsive buying was found to be associated with individuals' subjective wellbeing, susceptibility to interpersonal influence and negative affect (Silvera, Lavack, & Kropp, 2008). Therefore, impulsive buying can bring about harmful consequences. However, impulsive buying has also been reported to be accompanied by feelings of excitement, pleasure and hedonism (Rook, 1987). Indeed, Verplanken and Herabadi (2001) proposed that impulsive buying serves the function of affect regulation. They suggested that impulsive buying might be a way for individuals to deal with and channel their emotions by drawing from the pleasure of buying as a way to reward the self in positive emotions and a way to comfort the self when negative emotions arise. Aside from this possible function of affect regulation in impulsive buying, if one does not need to take the future into consideration, the possible negative consequences brought about by impulsive buying will probably not be as undesirable as one might think because

the mere fact that buying brings in material goods and the feeling of pleasure for individuals to enjoy at the moment can already be considered as rewarding and functional.

Individuals differ in their impulsivity level and impulsive buying tendency. They can possibility lead to positive or negative outcomes. Therefore, they can be used as a means to manage one's resources. We hypothesize that avoidant attachment being an adaptive response to a parenting style that was reflective of high risks and depleted resources in the environment should be related to high impulsivity and high impulsive buying tendency. This is because an impulsive strategy to manage one's resources in such risky resource-depleted environment where the future is uncertain or even unlikely and survival could be at danger any time is optimal for one's fitness.

Future Orientation

Individuals differ in their preference for the future or the present. Some researchers term this as time preference while others refer to this as delay discount rate which is closely linked to delay gratification. Individual differences in their orientation toward future and present have important effects on their behaviors which can have great impact and consequences both at individual and societal levels.

As Strathman, Gleicher, Boninger, and Edwards (1994) pointed out, individuals' decision making, behaviors and life outcomes can be affected by their differences in considering future consequences of current activities. People who are future-oriented are willing to forgo or delay instant rewards or benefits such as convenience and gratification in exchange for future, more desirable outcomes

that will not occur for a while. On the other hand, people who are not future-oriented concern about immediate benefits and outcomes, and do not focus on future consequences, they are more interested in instant pleasure and rewards.

Similar to the concept of future time perspective is delay gratification, a critical part of the self-regulatory capacity in which an individual is willing to spontaneously defer instant enjoyment and satisfaction so as to harvest future, often better, outcomes (Mischel, Shoda, & Rodriguez, 1989). Prior research suggested that preschoolers capable of delaying their gratification for a longer duration functioned more effectively in their adolescence by having higher cognitive ability (e.g., better academic achievement) and better social and/or emotional competence (e.g., better stress and frustration management). Alternatively, failure or short duration in delay gratification was associated with behavioral and emotional problems (Mischel, Shoda, & Peake, 1988; Rodriguez, Mischel, & Shoda, 1989). In a longitudinal study, children's attachment styles to their mother, both at ages 12 and 18 months and age six, were predictive of their ability to delay gratification at age six, with securely attached children delaying their gratification longer than children who showed high levels of anxiety and avoidance (Jacobsen, Huss, Fendrich, Kruesi, & Ziegenhain, 1997).

Parenting practice also has an impact on children's ability to delay gratification, children's capacity to delay gratification was cultivated to a greater extend if their parents' values were mainly consistent with that of society (Etzioni, 1986). In addition, people's perception and consideration of the future are related to their risk-taking attitudes and behaviors. In a study by Wilson and Daly (1997), homicide rates and some other dangerous competitive behaviors were strongly related to life expectancy, an implicit indication of the future – that is, individuals

living in an environment where local life expectancy was short, expected future value would be low. Engagement in risky competitive behaviors were more likely, showing that individual's time perspective about the future played an important role in risk taking. Since time preference or delay gratification is closely linked to the perception and feeling about the future (Mischel et al., 1988) and is one of the aspects of resource management, it should be related to attachment styles in similar fashion as a resource management strategy. It is hypothesized that individuals whose future is promising will be more likely to take the future into account when making their decisions and taking actions. Secure attachment as an adaptive response to a resource abundant low risk environment through supportive and responsive parenting styles should be positively associated with future orientation. This is because survival and living into the future is much more likely in this kind of safe environment. So the optimal strategy for individuals living in this environmental condition is to consider possible future consequences and invest more into the future for better potential fitness.

Risk Taking and Risk Propensity

Major research in risk taking has mainly identified risk taking as decision processes, personality traits, and social influence (Bromiley & Curley, 1992; Furby & Beyth-Maron, 1992; Gardner, 1993; Gardner & Herman 1991). There is variability in individuals' willingness and tendency to risk taking and this variability in risk taking can be domain specific (Weber, Blais & Betz, 2002; Rohrmann, 2005). Although risk taking is often associated with negative, undesirable outcomes such as harm, injury and death, it also comes with potential benefits and can result in positive outcomes such as chances to get some form of

reward (Leigh, 1999). As suggested by Trimpop (1994), individuals take risks to maximize their chances of survival and welfare.

Hill, Ross and Low (1997) have integrated life history theory into the study of risk taking and proposed that individuals' perception of the future environment and future value (e.g., availability and predictability of future resources and survival) would affect their risk-taking propensity and behaviors. By considering the impact of individuals' lifespan on risk taking, researchers found that the major factor influencing risk taking in adolescents is discounting the future (Gardner, 1993; Gardner & Herman 1991). Therefore, risk taking can be a strategy to manage one's resources in response to the socioecology of the individual. As avoidant attachment developed likely in response to a risky unpredictable environment where future is uncertain, it is hypothesized that risk taking propensity and behaviors should be positively associated with avoidant attachment. By being more willing to take risks, one might be able to obtain the positive reward such daring acts bring about. For individuals living in a high risk resource-depleted environment, being cautious and not taking any risks do not guarantee survival because adversities from the environment itself can already be life-threatening. On the contrary, taking risks in this kind of environment will be indeed optimal as risk taking might bring in "extra" reward for the individual.

Health Concerns and Health practices

It has been widely recognized that life style and behaviors have significant impact on individuals' health and well-being. Research has identified diet, smoking, alcohol consumption, and exercise as some of the major risk factors in morbidity and mortality (Wardle & Steptoe, 1991). In the European Health and

Behavior survey by Wardle and Steptoe it was discovered that people's beliefs about the importance of the behaviors for health maintenance and promotion were associated with health-related activities, suggesting that health practices were closely related to people's beliefs about the benefits of such health-related behaviors.

All else being equal, people who are more concerned about their health and take caution in taking care of their physical body will live relatively longer. Concerns about physical health can manifest in many forms, for example, by having a balanced diet, consuming foods that are high in fiber, avoiding smoking and too much alcohol, and foods that are high in fat, salt, and sugar, maintaining body weight within the normal range and regular exercise routine. By following these healthy practices, it will help individuals to reduce the risk of detrimental conditions such as obesity, heart disease, and cancer. However, it takes time, energy conscious effort and some inconvenience to be concerned about our own health and stay physically well yet the benefits usually are not immediately noticeable or obtainable. Besides, to stay healthy, individuals may need to suppress their natural impulse for instant gratification such as food palatability from foods that are rich in fat and sugar content, and euphoria from substances that are harmful to the body (e.g., hallucinogens and depressants). Concerns about physical health are closely tight to the concept of consideration for the future. In fact, Strathman et al. (1994) found in their study that individuals who were more future-oriented showed more concern for their health, consumed less alcohol and smoked fewer number of cigarettes. Therefore, it is proposed that people who are insecurely attached, especially those who are avoidantly attached, will be less concerned about their heath and less likely to put in conscious effort

to maintain good health since avoidant individuals should be less future-oriented due to their inherent uncertainty about the future. Thus, they will not see sacrificing convenience and pleasure as necessary for the here and the now.

Bodily Energy Level

Bodily energy level is a vital form of physical resource that sustains people's life. Low level of bodily energy, i.e., lack of or deficient in bodily energy, has been reported to be associated with psychiatric diagnosis such as depression (Chervin, 2000). In a study by McKinley & Randa (2005), they adopted Franzoi's (1995) body satisfaction measures which partly tapped participants' evaluations of their body functions such as energy level. Results from their study showed that body functions were related to anxious attachment. Anxious individuals reported lower satisfaction with their body functions, meaning that they were not satisfied with their body energy level. We propose that anxious attachment will be associated with high perception of bodily energy deficiency. According to our hypothesis, anxious attachment is triggered by parenting styles that are inconsistent, an indicator of an unstable environment with limited resources. Therefore, anxious individuals would be excessively concerned about extracting and conserving their energy and resources. Being constantly alert and perceiving their bodily energy as deficient motivate these anxious individuals to keep on extracting and hoarding resources and energy whenever they are available. This strategy in energy resource management for anxious individuals living in a low-resource unstable environment is optimal for their fitness.

2.4 Overview and Hypotheses

The aim of this present study is to take on an evolutionary approach to preliminarily examine of the relationships between attachment styles and resource management strategies in terms of impulsivity, buying tendency, future orientation, risk propensity and risk taking, health concerns and practices as well as bodily energy.

Drawn from the insights of evolutionary and life history theories of human development, attachment styles serve as adaptive mechanism for the child to respond to parenting styles reflective of the environmental conditions/socioecologies they are inheriting. When the environments are safe and resource availability is stable and predictable, mortality rates are low. K-selected strategies evolve in more stable environments where efficient extraction of resources from the environments is favored. K-selection is characterized by low fertility, producing fewer but better quality offspring. Effort is devoted to high parental investment so that offspring are more competitive (Figueredo et al., 2006). With environmental conditions that are predictably low-risk and resource-abundant, mothers are better able to direct these resources to their children and adopt supportive and sensitive parenting practice, thus, the development of secure attachment style.

On the other hand, when the environments are unpredictable and highly risky with depleted resource availability, individuals' lives are in danger. Mortality rates are high and unstable. Such harsh environmental conditions will buffer in individuals an r-selected strategy that is associated with high reproductive rates which emphasizes quantity over quality of offspring and low parental investment. r-selection occurs in unstable environments where

catastrophes could strike at any moment (Figueredo et al., 2006). In these high-risk resource-depleted environments, mothers are constantly dealing with their own survival demands. If there is really some resource available, mothers under these extremely difficult environmental conditions will allocate them to higher potential offspring or to mating rather than parenting effort. Therefore, parenting practice under such extremely harsh conditions will most likely be constantly unresponsive and rejecting which triggers in the child the development of avoidant attachment styles.

When the environments are unstable with limited resources rather than extreme depletion, levels of environmental certainty and predictability fall in between the two endpoints of the r/K continuum. With limited resources sometimes available and sometimes unavailable, mothers' survival demands are not yet an immediate concern but mothers in these environmental conditions need to look for and accumulate resources for themselves and for their offspring. So parenting practice will likely be inconsistent as these mothers will be taking an on-and-off approach in caring for their children depending on resource availability. Their children will then develop an ambivalent/anxious attachment style. Hence, parenting practice activating the ambivalent/anxious attachment style can be considered as falling in between r/K in terms of environmental predictability and strategies. Whereas parenting practice evoking avoidant attachment is linkable to r environment and strategy, parenting practice espousing secure attachment underlies K environment and strategy. Parenting practice inducing anxious attachment falls in between r and K environment and strategy.

Resource management strategies such as future orientation, impulsivity, health concerns and practices, bodily energy, risk taking and buying tendency can

bring about consequences that contribute to the human fitness of individuals if compatible correspondences between these resource management strategies and environmental conditions are in line. Since attachment styles are adaptive mechanism for children to respond to parenting practices that are reflective of the environmental conditions/socioecologies they are inheriting, they should be involved in the guiding processes of these resource management strategies.

More specifically, we hypothesize that unresponsive and rejecting parenting style indicates to the child that the environment is unpredictable, risky, and resource-depleted. Formation of insecure attachment styles, especially avoidant attachment style, and resource management strategies of high risk taking and propensity, high buying tendency, low concern for health and health practices (e.g., not spending the time and effort to be concerned about their health but enjoy the food and store the fat as well as the pleasure available), and low concern for the future would be adaptive strategies for individuals living under these extremely difficult environmental conditions and socioecology since the future is uncertain or unpromising.

Alternatively, for individuals who have developed secure attachment as a response to consistent and supportive parenting style signaling a stable and resource-abundant environment, managing their resources by being more concerned about their physical health, avoiding high risk behaviors, buying at reasonable level rather than impulsively, and considering for the future would be optimal resource management strategies for the predictable and resource-abundant environmental conditions these individuals are living in.

We further hypothesize that inconsistent parenting style signals to the child that the environment is unstable with resource shortage rather than depletion.

Mothers in this case are willing but unable to invest in their children due to limited availability of resources. Formation of ambivalent/anxious attachment and resource management strategies of frugal or careful buying and risk avoidance, high sensitivity to bodily energy level, and energy conservation are optimal strategies for individuals living in this kind of unstable resource shortage environment. Since environmental predictability and strategies fall in between the r/K continuum for anxious attachment, the predictive power of resource management strategies by anxious attachment style is not expected to be as strong as the two extreme endpoints of environmental certainty and predictability associated with r and K strategies. These hypotheses were tested in the following studies.

Chapter 3: Study One

Study 1 – Testing the relationship between retrospective attachment styles to caregivers and resource management strategies with adult participants using self-report measures

3.1 Overview

In this study the relationships between attachment styles to primary caregiver and resource management strategies in terms of health concerns, bodily energy deficiency, buying tendency, risk propensity, impulsivity, and future orientation were examined using self-report questionnaires. It was hypothesized that individuals with insecure attachment styles to their caregiver would use different strategies when managing their resources with reference to the different socioecology and environmental conditions they inherited. More specifically, when compared to individuals who scored low on avoidant and anxious attachment (i.e., the securely attached), those high on avoidant attachment would be more impulsive, less future-orientated, more likely to buy impulsively, tend to take more risks, and be less concerned about their health so as to obtain instant rewards/benefits right away; whereas those high on anxious attachment would tend to buy less and perceived themselves as having lower bodily energy in order to conserve and hoard resources. Such strategies could contribute to the optimal adaptation in corresponding environments. The differentiation between the two insecure attachment styles, anxious and avoidant, and their effects on resource management strategies were tested as an initial exploration.

3.2 Method

Participants

One hundred and sixty-four university students from a university in Beijing, China took part in this study by filling out a battery of questionnaires, of which 84 were males and 80 were females. Majority of the participants were from middle-class families. Mean age of the participants was 20.10 years (SD = .90). Ten *yuan* (about HKD 12) was offered to each participant as an appreciation of their participation in this study.

Procedures

Participants were asked to respond to a battery of self-report scales to measure their (1) attachment styles to their specified primary caregivers when they were young, (2) buying tendency, (3) impulsivity, (4) future orientation, (5) health concerns, (6) bodily energy deficiency, and (7) risk propensity. Scales in this study were administered in Chinese, participants' native language. For the scales that were originally written in English, back-translation technique was employed to ensure linguistic equivalence. Informed consent was obtained before the study began and participants were debriefed at the end of the study.

Measures

Attachment to caregiver. Experiences in Close Relationships (ECR) (Brennan et al., 1998) measure was slightly modified to assess participants' attachment orientations toward their primary caregiver retrospectively, i. e., participants were instructed to recall their attachment styles to their primary caregiver when they were young. With this ECR scale, participants' attachment styles to their caregivers were measured on two orthogonal dimensions, i.e., avoidance and anxiety. A total of 36 items assessed the avoidance and anxiety dimensions with two 18-item subscales. Items were answered on 7-point, Likert-type scales, with responses ranging from 1 (*disagree strongly*) to 7 (*agree*

strongly). Sample question for the avoidant dimension was "I tried to avoid getting too close to my mother" and for the anxiety dimension was "If I couldn't get my mother to show interest in me, I got upset or angry".

Buying tendency. The Impulse Buying Tendency Scale (Verplanken & Herabadi, 2001) was used to measure participants' tendency to buying impulsively. The Impulse Buying Tendency Scale consisted of 20 items, with ten items for each of the two aspects: cognitive (a lack of deliberation and planning) and affective (feeling of regret, lack of control, compulsion and pleasure). Participants responded to these items on 7-point agree-disagree Likert type scales and high scores indicated high tendency in impulse buying. Sample question for the cognitive aspect was "I often buy things without thinking" and for the affective aspect was "I sometimes cannot suppress the feeling of wanting to buy something".

Future orientation. The Consideration of Future Consequences Scale (Strathman et al., 1994) was used to measure the individual difference in considering distant versus immediate consequences of potential behaviors. This scale consisted of twelve items, with responses ranging from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). Sample questions were "I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes" and "I only act to satisfy immediate concerns, figuring the future will take care of itself" (reverse-scored). Higher scores indicated more concern for distant consequences of potential behaviors and higher ability to delay gratification.

Risk propensity. The Rohrmann Risk Propensity Questionnaire (Rohrmann, 2005) was used to assess participants' general inclination to risk taking. It

consisted of five questions in the domain of physical, financial, health, social and general risk. Responses ranged from 0 "extremely low" to 10 "extremely high." Higher scores indicate higher propensity for risk acceptance. Sample item included: "Some activities involve a "physical" risk, such as particular occupations (e.g. underground miner) or sports (e.g., rock-climbing) or transportation (e.g., cycling) – that is, there is a risk of getting injured in an accident or possibly even death. In general, my propensity for accepting physical risks is..."

Impulsivity. To measure participants' general impulsiveness the widely used Barratt Impulsiveness Scale, Version 11 (BIS-11; Patton et al., 1995) was employed. There were thirty items in this scale, tapping people's motor impulsivity, inability to delay gratification, lack of perseverance, attention impulsivity, cognitive complexity, and self-control. Responses ranged from 1 = rarely/never, 2 = occasionally, 3 = often, to 4 = almost always/always. Item scores were averaged to form a total impulsivity score. Sample items included: "I act on the spur of the moment", and "I spend more money than I should." Higher scores indicated greater impulsivity.

Health concerns. Relevant questions from the Health and Behaviour Survey (Wardle & Steptoe, 1991) were adapted and slightly modified to assess participants' behaviors and attitudes toward the importance of behaviors for health. Participants were asked to rate on five-point Likert scales (1 = of very low importance, 5 = of very great importance) how important they feel the listed 11 health measures were, e.g., "To take regular exercise", "Not to smoke", and "To attend to good health care habits and take good care of my body." Higher scores indicated more concerns about behaviors for health, meaning that health measures

were important and that healthy behaviors were of high concern to them in maintaining good health.

Bodily energy deficiency. A newly developed scale tapping participants' bodily energy deficiency was used. There were six items in this scale with responses ranging from 1 = disagree strongly to 5 = agree strongly. Sample items included: "I feel tired all over my body", and "I am not motivated/interested to do things because I feel so tired and lack of energy". Higher scores indicated having lower perceived energy level, i.e., lacking of energy.

In the end, participants completed some basic demographic information and received a debriefing sheet informing them of the purpose of the study. Each participant was paid ten *yuan* for participating in this study.

3.3 Results

Descriptive and reliability statistics, including means, standard deviations, Cronbach alphas, and correlation matrix of variables are shown in Table 3.1.

Zero-order correlations among the variables were in general consistent with our hypothesis. To summarize, the correlations between avoidant attachment and resource management strategies in terms of impulsivity, risk propensity, and bodily energy deficiency were positive while in terms of future orientation and health concerns were negative. The correlation between anxious attachment and bodily energy deficiency was positive. This means that individuals who scored high on avoidant attachment were significantly more impulsive, more deficient in bodily energy, had greater risk propensity, were less future-oriented, and were less concerned about their health. Their tendency to buy impulsively was not significantly correlated with their avoidant attachment style although the direction

of the correlation (positive) was consistent with our hypothesis. Individuals who scored high on the anxious dimension of attachment were more deficient in their bodily energy, even more so than those who scored high on avoidant attachment.

Table 3.1

Descriptive Statistics, Cronbach Alphas and Correlations among Variables in Study 1

	No. of items	*Mean*	*Standard deviation*	α	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1. Avoidant Attachment	18	2.80	.37	.93							
2. Anxious Attachment	18	2.89	.51	.87	.27 **						
3. Impulsivity	30	1.95	1.07	.79	.25 **	.09					
4. Future Orientation	12	3.29	.56	.78	-.16 *	-.10	-.25 **				
5. Risk Propensity	5	4.69	.80	.76	.27 **	-.01	-.01	-.04			
6. Buying Tendency	20	2.58	.48	.81	.14	-.02	.17 *	-.26 **	.07		
7. Bodily Energy Deficiency	6	2.36	.93	.87	.20 **	.31 **	.09	-.04	-.08	.12	
8. Health Concerns	11	4.06	1.07	.80	-.45 **	-.06	-.24 **	.19 *	-.13	-.15	-.11

Note. $N = 164$

$^{*}p < .05$; $^{**}p < .01$.

In this study regression analyses were conducted to test the effects of avoidant and anxious attachment on resource management strategies in terms of impulsivity, future orientation, risk propensity, buying tendency, bodily energy deficiency, and health concerns. To examine the contribution of avoidant and anxious attachment in predicting resources management strategies, effects of participant's age, gender, and SES were controlled for by entering these demographic variables into the regression equation. Additional contribution of attachment styles in predicting the different resource management strategies was tested by entering attachment styles into the second step of each of the regression analyses. Based on our hypotheses, attachment styles will contribute significant additional variance over and above participants' age, gender and SES in the prediction of resource management strategies.

Predicting Impulsivity by Using Avoidant and Anxious Attachment with Primary Caregiver

Multiple regression analyses were conducted to investigate the predictive power of avoidant and anxious attachment in impulsivity. Age, gender, and SES were entered into the first step while avoidant and anxious attachment were entered into the second step of the multiple regression analyses to check for their predictive power. According to our hypothesis, avoidant attachment would be a significant predictor (positively associated) of impulsivity, more so than anxious attachment even after controlling for the effects of demographic variables.

Results from hierarchical regression analysis (see Table 3.2) showed that the overall model was significantly different from zero, $F_{(5, 158)} = 2.52$, $p = .032$. Age ($\beta = .04$, $t = .49$, $p = .62$, *n.s.*), gender ($\beta = .06$, $t = .72$, $p = .47$, *n.s.*), and SES

($\beta = .08$, $t = 1.07$, $p = .28$, *n.s.*) were not significant predictors of impulsivity. Addition of attachment styles improved the predictive power of impulsivity by 7.1%, $F_{(2, 158)} = 6.05$, $p = .003$. Out of all the predictor variables examined, only avoidant attachment ($\beta = .27$, $t = 3.28$, $p = .001$) contributed significant predictive power in impulsivity. That is, the variability in impulsivity was predicted by knowing scores on avoidant attachment, and one unit increase in impulsivity was associated with .27 unit increase in avoidant attachment. This suggests that individuals who were more avoidant had higher impulsivity. This result was consistent with our hypothesis.

Table 3.2

Summary of Regression Analyses for Variables Predicting Impulsivity in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.04	.49			
	Gender	.06	.72			
	SES	.08	1.07	.003	-.016	.16
	Avoidant	.27***	3.28***			
	Anxious	.03	.31	.074*	.045*	2.52*
					$\Delta R^2 = .071$**	

Note. *$p < .05$; **$p < .01$; ***$p = .001$.

Predicting Future Orientation by Using Avoidant and Anxious Attachment with Primary Caregiver

To predict future orientation, multiple regression analyses were conducted. Age, gender, and SES were entered into the first step, and avoidant and anxious attachment were entered into the second step. We predicted that avoidant attachment would be a significant predictor (negative correlation) of future orientation.

Results (see Table 3.3) showed that although the direction of the effect of avoidant attachment was consistent with what we have predicted (β = -.14, t = -1.63, p = .11, *n.s.*; more avoidant, less future-oriented), the overall model was not significantly different from zero, $F_{(5, 158)} = 1.50$, $p = .19$, *n.s.* None of the predictor variables tested was useful in predicting future orientation in this study.

Table 3.3

Summary of Regression Analyses for Variables Predicting Future Orientation in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	-.11	-1.36			
	Gender	.06	.67			
	SES	-.01	-.15	.024	.005	1.29
	Avoidant	-.14	-1.63			
	Anxious	-.04	-.53	.045	.015	1.50
					ΔR^2 = .022	

Predicting Risk Propensity by Using Avoidant and Anxious Attachment with Primary Caregiver

To test the contribution of avoidant and anxious attachment to the prediction of risk propensity, multiple regression analyses were conducted. Age, gender, and SES were entered into the first step, avoidant and anxious attachment were entered into the second step. According to our hypothesis, avoidant attachment would be a significant predictor (positive association) of risk propensity, more so than anxious attachment even after controlling for the effects of demographic variables.

Results from hierarchical regression analysis (see Table 3.4) showed that the overall model was significantly different from zero [$F_{(5, 158)} = 4.16$, $p = .001$] and could account for 11.6% of the variance in risk propensity. Adding attachment styles to the model significantly increase the predictive power of risk propensity by 5.4% [$\Delta R^2 = .054$, $F_{(2, 158)} = 4.85$, $p = .009$]. Avoidant attachment ($\beta = .25$, $t = 3.07$, $p = .003$) and gender ($\beta = -.20$, $t = -2.46$, $p = .02$) were the two significant predictors of risk propensity while age ($\beta = -.07$, $t = -.94$, $p = .35$, *n.s.*), SES ($\beta = -.01$, $t = -.14$, $p = .89$, *n.s.*) and anxious attachment ($\beta = -.10$, $t = -1.25$, $p = .21$, *n.s.*) did not significantly predict risk propensity. When all other predictor variables were controlled for, one unit increase in risk propensity was associated with .25 unit increase in avoidant attachment. The variability in risk propensity was predicted by knowing scores on avoidant attachment and gender of the individuals. The size and direction of the relationships suggest that being male and more avoidant are associated with higher tendency to risk taking. This is consistent with our hypothesis.

Table 3.4

Summary of Regression Analyses for Variables Predicting Risk Propensity in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	-.07	-.94			
	Gender	-.20*	-2.46*			
	SES	-.01	-.14	.062*	.044	3.53*
	Avoidant	.25**	3.07**			
	Anxious	-.10	-1.25	.116***	.088	4.16***
						$\Delta R^2 = .054$**

Note. *$p < .05$; **$p < .01$; ***$p \leq .001$.

Predicting Buying Tendency by Using Avoidant and Anxious Attachment with Primary Caregiver

Multiple regression analyses were conducted to predict buying tendency by entering age, gender, and SES into the first step, and avoidant and anxious attachment into the second step. We predicted that avoidant attachment would be a significant predictor (positive correlation) of buying tendency.

Results from regression analyses (see Table 3.5) demonstrated that the overall model was not significantly different from zero [$F_{(5, 158)} = 1.62$, $p = .16$, *n.s.*], none of the predictor variables in this model except avoidant attachment ($\beta = .20$, $t = 2.34$, $p = .02$; more avoidant, higher tendency to buy) contributed significant predictive power to buying tendency.

Table 3.5

Summary of Regression Analyses for Variables Predicting Buying Tendency in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.02	.23			
	Gender	.12	1.48			
	SES	.11	1.42	.016	-.003	.85
	Avoidant	.20*	2.34*			
	Anxious	-.04	-.51	.049	.019	1.62
						$\Delta R^2 = .033$

Note. $*p < .05$.

Predicting Bodily Energy Deficiency by Using Avoidant and Anxious Attachment with Primary Caregiver

To examine the relationships between attachment styles and bodily energy deficiency, multiple regression analyses were conducted. Age, gender, and SES were entered into the first step while avoidant and anxious attachment were entered into the second step. We predicted that anxious attachment will be significantly predictive of perceived bodily energy deficiency (positive association – more anxious, greater perception of bodily energy as deficient) due to the tendency of anxious individuals to constantly extract and accumulate bodily energy and thus persistent alert and perception of deficient bodily energy level.

Results (see Table 3.6) showed that the overall model was significantly different from zero ($F_{(5, 158)} = 4.03, p = .002$) and could account for 11.3% of the variance in bodily energy deficiency. Age ($\beta = -.02, t = -.27, p = .79, n.s.$), gender ($\beta = -.02, t = -.25, p = .81, n.s.$), and SES ($\beta = -.01, t = -.15, p = .88, n.s.$) were not significant predictors of bodily energy deficiency. Addition of attachment styles improved the predictive power of bodily energy deficiency by 10.2% [$\Delta R^2 = .102$, $F_{(2, 158)} = 9.11, p = .000$] over and above age, gender, and SES. Out of all the predictor variables examined, only anxious attachment ($\beta = .28, t = 3.53, p = .001$) contributed significant predictive power in bodily energy deficiency. That is, the variability in bodily energy deficiency was predicted by knowing scores on anxious attachment, and one unit increase in perceived bodily energy deficiency was associated with .28 unit increase in anxious attachment. This suggests that individuals who were more anxious had higher perception of bodily energy deficiency. This is consistent with our hypothesis.

Table 3.6

Summary of Regression Analyses for Variables Predicting Bodily Energy Deficiency in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	-.02	-.27			
	Gender	-.02	-.25			
	SES	-.01	-.15	.011	-.008	.58
	Avoidant	.12	1.47			
	Anxious	.28***	3.53***	.113**	.085	4.03**
						$\Delta R^2 = .102$***

Note. **$p < .01$; ***$p \leq .001$.

Predicting Health Concerns by Using Avoidant and Anxious Attachment with Primary Caregiver

Multiple regression analyses were conducted to predict health concerns using avoidant and anxious attachment. Age, gender, and SES were entered into the first step, avoidant and anxious attachment were entered into the second step. It is predicted that avoidant attachment would be a significant predictor (negative association) of health concerns.

Results (see Table 3.7) showed that the overall model was significantly different from zero ($F_{(5, 158)} = 8.85, p = .000$) and accounted for 21.9% of the variance in health concerns. Addition of attachment styles improved the predictive power of health concerns by 17.7% [$\Delta R^2 = .177, F_{(2, 158)} = 17.89, p = .000$] over and above age, gender, and SES. Out of all the predictor variables examined, only avoidant attachment ($\beta = -.45, t = -5.95, p = .000$) contributed significant predictive power in health concerns. Age ($\beta = .06, t = .79, p = .43$, *n.s.*), gender ($\beta = .09, t = 1.19, p = .24$, *n.s.*), SES ($\beta = -.08, t = -1.10, p = .28$, *n.s.*) and anxious attachment ($\beta = .06, t = .81, p = .42$, *n.s.*) were not significant predictors of health concerns. By knowing the scores on avoidant attachment, the variability in health concerns could be predicted. Increasing health concerns by one unit was associated with a decrease in avoidant attachment by.45 unit. This suggests that individuals who were more avoidant were less concerned about their health. This is consistent with our hypothesis.

Table 3.7

Summary of Regression Analyses for Variables Predicting Health Concerns in Study 1

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.06	.79			
	Gender	.09	1.19			
	SES	-.08	-1.10	.042	.024	2.34
	Avoidant	-.45***	-5.95***			
	Anxious	.06	.81	.219***	.194	8.85***
						ΔR^2 = .177***

Note. ***$p < .001$.

3.4 Discussion

This study investigated the relationships between attachment styles to primary caregiver and resource management strategies in terms of health concerns, bodily energy deficiency, buying tendency, risk propensity, impulsivity, and future orientation using self-report approach with college students. Consistent with our hypotheses, findings in this study revealed that avoidant attachment was useful in predicting impulsivity, risk propensity, and health concerns, while anxious attachment was useful in predicting bodily energy deficiency. Results demonstrated that individuals who scored high on avoidant attachment were more

impulsive, had higher risk propensity, and were less concerned about their health. Consistent with previous literature, gender also had an effect on risk-taking propensity, i.e., males in this study had higher tendency to take risks. Those who scored high on anxious attachment were more likely to perceive their bodily energy level as deficient. However, our prediction that future orientation and buying tendency could be predicted by avoidant attachment was not supported. Both avoidant and anxious attachment styles did not predict future orientation and buying tendency. Attachment styles were useful in predicting the resource management strategies examined in this study after the effect of SES was statistically controlled for.

Findings in this study generally supported our hypotheses that attachment styles were associated with resource management strategies including physical health and external resource utilization.

Chapter 4: Study Two

Testing the relationship between attachment styles to mother and resource management strategies with adolescents using experimental tasks, self-reports, and other's report

4.1 Overview

This second study supplemented Study 1 by looking at the relationship between attachment and resource management strategies with the addition of other's report on attachment styles and experimental tasks using adolescents as our target group. Besides, different scales from Study 1 – the Coping Strategies Questionnaire (Finnegan, Hodges, & Perry, 1996) and Security Scale (Kerns, Tomich, Aspelmeier, & Contreras, 2000) – were used to measure attachment to mother-figure. In this study the relationship between attachment styles to mother-figure and resource management strategies in terms of future orientation, impulsivity, health practices, and risk taking was tested with adolescents using both self-report and other's report, as well as experimental tasks. Self-report measures on health practices and risk taking asked participants to report on their actual health habits and engagement in risky activities. Thus, these ratings served as behavioral data. Self-report measures on future orientation and impulsivity assessed participants' attitudes and tendency toward future orientation and impulsivity. Therefore, we further obtained data from experimental tasks which measured the behavioral aspect of future orientation and impulsivity. Resource management strategies in terms of buying tendency and bodily energy deficiency were not assessed in this study with adolescents. The reason for such decision was that variation in monetary resource available to this adolescent group of participants for monetary buying may not be significant enough for the results to

show meaningful differences. This young age group of participants may not be able to report on bodily energy deficiency as accurately as adult participants could in study 1. It was hypothesized that avoidant coping would be associated with lower future orientation, higher impulsivity, less healthy practices and more risk-taking behaviors in order to garner instant rewards, and the opposite would probably be true for security coping so that better future rewards could be collected. Preoccupied coping would be associated with less risk-taking behaviors.

4.2 Method

Participants

Eighty-one students (39 males and 42 females) from middle-class families were recruited from a primary and secondary school in Guangzhou, China to take part in this study by filling out a battery of questionnaires and participated in a series of experimental tasks. Mean age of the participants was 13.69 years (SD = 2.27, ranged from 11 to 18 years old). A small gift was offered to each participant as an appreciation of their participation in the study. All participants' mothers were invited to fill out a simple questionnaire (by courtesy), reporting on the attachment style of their own child.

Procedures

Prior to the administration of the study, a letter briefly describing this study was sent to each participant's parent. Enclosed in this letter were a consent form and the Coping Strategies Questionnaire (Finnegan et al., 1996) and Security Scale (Kerns et al., 2000). Since these adolescent participants were under the age of 18, acknowledgement of participation agreement was sought from their parents

before participation. For parents who granted participation permission of their children, they were invited to fill out the Coping Strategies Questionnaire and the Security Scale, reporting on their children's attachment coping strategies with their mother-figure. This served as other's report of the adolescent participants' attachment style to their mother-figure. The participants handed in the signed consent form together with their mother's completed Coping Strategies Questionnaire and Security Scale directly to the experimenter right before the experimental tasks began so that the experimenter could match the mother's report with the participants' self-report and experimental responses.

During the study participants were asked to respond to a battery of self-report scales to measure their attachment style to their mother-figure when they were young, their future orientation, impulsivity, health practices and risk-taking behaviors. For the self-report questionnaires, measures used were those that have been shown to be valid and reliable with adolescent samples.

Measures

Attachment to mother-figure (mother's report of the child). The Coping Strategies Questionnaire (Finnegan et al., 1996) and Security Scale (Kerns et al., 2000) were used. Participant's mothers were asked to respond to these two scales by reporting how their child reacted/would react to situations and scenarios stated in the items of these two scales.

At the beginning of the attachment questionnaire (both for the mother's report and the participant's self-report), there were instructions clearly stating that "mother" in the questionnaire referred to "mother-figure", i.e., the primary caregiver who provided major care to the participant when he/she was young. If it was the participant's grandmother who provided major care to the participant

while he/she was young, then the mother-figure referred to in the questionnaire would be the participant's grandmother. This point was made clear to the participants and their mother because participant's primary attachment figure may not always be their mother.

The Coping Strategies Questionnaire and Security Scale were designed to tap adolescent participants' attachment coping strategies to their mother-figure in times of stress. In the Coping Strategies Questionnaire there were ten items in each of the two attachment styles of relating to mother, tapping avoidant and preoccupied (anxious) coping strategies. Items were in the form of hypothetical scenarios, participants were asked to imagine that they were experiencing these situations with their mother. For the items in avoidant and preoccupied coping, there were two possible reactions (either avoidant vs. non-avoidant response, or preoccupied vs. non-preoccupied response) for the participants to choose from, after which the participants would pick within their choice of reaction whether that choice was "really true for me" or "sort of true for me", a format adapted from Harter (1982) to minimize social desirability in responses. Items in this Coping Strategies Questionnaire were scored as 0, 1, or 2. Total scores on avoidant and preoccupied coping styles were calculated by averaging item scores on each of the coping styles. Higher scores indicated more preoccupied or avoidant coping style with mother.

There were eight items in the Security Scale tapping participant's felt security with their attachment figure. Response format was the same as the Harter's and participants chose which statement was more characteristic of them and then indicated within their choice of the statement whether it was "really true for me" or "sort of true for me". Items were scored from 1-4, and averaged item

scores served as the total score of security. Higher scores suggested more secure attachment to mother-figure. For more details of the questionnaire and item format, see Finnegan et al. (1996) and Kerns et al. (2000). Sample item from Preoccupied Coping included: "One day at school the teacher misunderstands something you did and scolds you for it. You become upset. Some kids would stay upset until they talked to their mother about it BUT Other kids would be able to calm themselves down without talking to their mother"; from Avoidant Coping: "One day you come home from school upset about something. Your mother asks you what the problem is. Some kids wouldn't want to talk to her about it BUT Other kids would want to talk to her about it"; and from Security Coping: "Some kids worry that their mom might not be there when they need her BUT Other kids are sure their mom will be there when they need her".

Attachment to mother-figure (self-report). Participants were asked to fill out the same Coping Strategies Questionnaire (Finnegan et al., 1996) and Security Scale (Kerns et al., 2000) which were used to measure participant's attachment style to their mother-figure. Details of these two scales were the same as stated above.

Future orientation. The "Future Outlook Inventory" developed by Cauffman and Woolard, (1999) was used to measure participants' tendency to consider future consequences in daily life. This inventory consists of 15 items, each included two opposing statements describing future orientation on a "less – more" continuum. Participants were asked to pick the statement that was more true about themselves from the two opposing sides and indicated if the statement they had chosen was "really true" or "sort of true". Items were scored on a 1-4 point scale, averaged scores of all the 15 items served as the total score of Future

Orientation. Higher scores indicated stronger future orientation. Sample item included: "Some people spend very little time thinking about how things might be in the future BUT other people spend a lot of time thinking about how things might be in the future."

Impulsivity. The widely used Barratt Impulsiveness Scale, Version 11 (BIS-11; Patton et al., 1995) was employed to measure participants' general impulsivity. There are thirty items in this scale, tapping people's motor impulsivity, inability to delay gratification, lack of perseverance, attention impulsivity, cognitive complexity, and self-control. Responses ranged from 1 = rarely/never, 2 = occasionally, 3 = often, to 4 = almost always/always. Item scores were averaged to form a total impulsivity score. Sample items included: "I act on the spur of the moment", and "I spend more money than I should." Higher scores indicated greater impulsivity.

Health practices. Relevant questions from the Health and Behaviour Survey (Wardle & Steptoe, 1991) were adapted and modified to assess participants' daily health practices and health concerns. Participants were asked to report on five-point Likert scales (1 = never, to 5 = always) the frequency that they engaged in a variety of behaviors related to health in their daily life. Higher scores indicated more frequent engagement in healthy practice, meaning that they were taking better care of and wee more concerned about their health when compared to participants who had lower scores on this measure. Sample items included "I eat fruits", and "If something is good for health, I will do it.

Risk-taking behavior. The Perception of Risk Scale adapted from Benthin, Slovic, & Severson (1993) was used to assess participants' risk taking behaviors. Participants were asked to report their engagement in the following risky activities

on 4-point scales: drinking alcohol, vandalizing property, riding in a car with a drunk driver, smoking cigarettes, having unprotected sex, stealing from a store, getting into a physical fight, going into a dangerous part of town, and threatening or injuring someone with a weapon. Engagement in each activity counted toward the risk-taking index. Higher scores indicated more risk-taking behaviors.

Experimental tasks

Delay discounting. In the Delay Discounting task (Steinberg et al., 2009), participants were given two reward options to choose from, an immediate reward of an amount always less than $1,000 or a constant delayed reward at $1,000 each time. The time delayed for the reward varied at six time-points, i.e., 1 day, 1 week, 1 month, 3 months, 6 months, and 1 year. If participants chose the delayed reward in a trial, the next trial would present an immediate reward in an amount higher than the previous trial (half way between the previous amount and $1,000). If participants chose the immediate reward, the next trial would present an immediate reward in an amount lower than the previous trial (half way between the previous amount and $0). Participants continued through the nine ascending and descending options until their preference for delayed and immediate reward were equal in amount. This subjective value of the delayed reward if it were offered immediately was referred to as the "indifference point". An average indifference point was computed for the delay intervals. This served as an index of participant's preference for future orientation. Higher indifference point indicated greater future orientation, meaning that they were more able and willing to take the future into account and delayed their lower instant rewards for higher future rewards.

Tower of London. Borrowed from the computerized version of the Tower of London experiment (Berg & Byrd, 2002), an index of participant's behavioral impulsivity was generated by asking the participants to match on the computer screen the starting pattern of the balls on one side to a prearranged goal pattern on the other side. There were three pegs of different lengths and three colored balls shown on the screen. The first peg on the left could hold three balls, while the middle peg could hold two balls and the last peg on the right could hold only one ball. The goal of this task was to make these balls match the goal pattern by shifting the balls presented on the starting pattern around. Participants used the computer cursor to drag and drop the balls to the position they wanted and they were told that they should try their best to make as few moves as they could to match the goal pattern. There were five sets of four problems, the first four problems could be solved in three moves, to the ones that required at least seven moves. Participants could take as much or as little time as they wanted before they start their first move in each of the problems. Time elapsed in milliseconds between presentation of each problem and participants' first moves, called *first-move latency*, was recorded and used as an indicator of impulse control. Shorter latencies to the first move indicated higher impulsivity. As demonstrated by Asato, Sweeney, and Luna (2006), first-move latency was useful in predicting individual's ability to plan before acting. Rapidity and recklessness in first moves have been found to associate with difficulties in response inhibition in different age groups. Therefore, first-move latency was used as our measure of behavioral impulsivity in this study.

Basic demographic information about the participants was collected, and they were briefly informed of the purpose of the study and offered a small gift each for their participation in this study.

4.3 Results

Descriptive and reliability statistics, including means, standard deviations, Cronbach alphas, and correlation matrix of variables are shown in Table 4.1. Participant's self-reported and mother-reported scores on avoidant coping, preoccupied coping and security coping were consistent within each strategy and were thus averaged to form composite scores in avoidant coping, preoccupied coping and security coping for a more objective estimate of the attachment coping strategies.

Zero-order correlations among the variables were in general consistent with our hypothesis. To summarize, significant correlations revealed that more avoidant coping strategy was positively correlated with impulsivity and risk-taking behavior, but negatively correlated with future orientation and health practices. This means that individuals who were more avoidant in relating to their attachment figure were likely to be more impulsive, took more risks, were less concerned about their health and had fewer healthy habits, and were more concerned about the immediate than about the future.

On the contrary, security coping strategy was positively correlated with future orientation and health practices but negatively correlated with impulsivity and risk-taking behavior. This suggested that individuals who were more securely attached to their mother-figure were more future-oriented, i.e., they would take the future into account when making decisions or taking actions. They were more

concerned about their health and had more healthy habits. They were less impulsive and engaged in fewer risk-taking behaviors.

Preoccupied coping strategy was negatively correlated with risk-taking behaviors, meaning that individuals who were more preoccupied in their coping style with their attachment figure were less likely to engage in risk-taking behavior.

Table 4.1

Descriptive Statistics, Cronbach Alphas, and Correlations among Variables in Study 2

		No. of items	*Mean*	*Standard deviation*	α	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1.	Avoidant	10	.46	.33	.78								
2.	Preoccupied	10	.59	.33	.72	-.52 ** [-.41] ** (-.63) **							
3.	Security	8	2.72	.35	.61	-.51 ** [-.43] ** (-.64) **	.17 [-.02] (.45) *						
4.	Future Orientation	15	2.98	.45	.71	-.32 ** [-.27] * (-.52) **	.09 [.06] (.25)	.40 ** [.40] ** (.44) **					
5.	Impulsivity	30	2.06	.33	.78	.40 ** [.40] ** (.28)	-.14 [-.08] (-.08)	-.23 * [-.27] (-.19)	-.42 ** [-.54] ** (-.27)				
6.	Health practices	11	3.65	.57	.78	-.44 ** [-.38] ** (-.41) *	.17 [.15] (-.03)	.37 ** [.46] ** (.30)	.46 ** [.51] ** (.55) **	-.37 ** [-.38] ** (-.19)			

Table 4.1 (con't)

		No. of items	*Mean*	*Standard deviation*	α	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
7.	Risk-taking Behavior	9	1.80	1.67	.61	.41 ** [.31] * (.48) *	-.30 ** [-.25] (-.25)	-.31 ** [-.27] * (-.36)	-.24 * [-.38] ** (-.06)	.31 ** [.32] * (.18)	-.37 ** [-.48] ** (-.09)		
8.	Delay Discounting		618.17	241.30		.00 [.03] (-.09)	-.08 [-.12] (.03)	.11 [-.04] (.28)	.04 [.02] (.05)	.13 [.20] (-.04)	.12 [.08] (.25)	-.10 [-.03] (-.24)	
9.	Tower of London		6248.4	4704.06		.29 ** [.05] (.36)	-.42 ** [-.26] (-.47) *	.06 [.08] (.10)	.05 [.01] (.01)	.18 [.00] (.17)	-.10 [-.01] (.13)	.12 [-.05] (.06)	.17 [.07] (.23)

Note. $N = 81$ (whole sample), Age = 11-18 years

$N = 54$, Age = 11-14 years, correlations shown in [ ]

$N = 27$, Age = 15-18 years, correlations shown in ( )

*$p < .05$; **$p < .01$.

Multiple regression analyses were conducted to test the effects of attachment coping strategies and examine their contributions in predicting resource management strategies in terms of future orientation, impulsivity, healthy practice, and risk taking. Effects of participant's age, gender, SES and highest education level in the household were controlled for by entering these demographic variables into the regression equation. The contribution of attachment coping strategies in the prediction of resource management strategies was examined by entering them into the second step of each of the regression analyses. Based on our hypotheses, attachment styles would contribute significant additional variance over and above participants' age, gender, SES and highest education level in the household in the prediction of resource management strategies.

Predicting Future Orientation by Using Attachment Coping Strategies with Mother-figure

To test the contribution of attachment coping strategies in predicting future orientation, multiple regression analyses were conducted. Age, gender, SES and highest education level in the household were entered into the first step. Security coping, preoccupied coping, and avoidant coping were entered into the second step of the regression analyses.

Results from hierarchical regression analysis (see Table 4.2) showed that the overall model was significantly different from zero [$F_{(7, 73)} = 4.29$, $p = .001$] and accounted for 29.1% of the variance in future orientation. Adding attachment coping strategies to the model significantly increase the predictive power of future orientation by 19.8% [$\Delta R^2 = .198$, $F_{(3, 73)} = 6.80$, $p = .000$]. Security coping (β

= .34, t = 2.86, p = .01) and SES (β = .32, t = 3.05, p = .003) were the two significant predictors of future orientation while age (β = .21, t = 1.92, p = .06, *n.s.*), gender (β = .07, t = .64, p = .52, *n.s.*), highest education level in the household (β = -.11, t = -1.05, p = .30, *n.s.*), preoccupied coping strategy (β = .03, t = .21, p = .84, *n.s.*) and avoidant coping strategy (β = -.17, t = -1.24, p = .22, *n.s.*) did not significantly predict future orientation. When all other predictor variables were controlled for, one unit increase in future orientation was associated with .34 unit increase in security coping, and .32 unit increase in SES respectively. The variability in future orientation was predicted by knowing scores on security coping and SES of the individuals. The size and direction of the relationships suggest that use of more security coping and higher SES were associated with higher future orientation.

Table 4.2

Summary of Regression Analyses for Variables Predicting Future Orientation in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.21	1.92			
	Gender	.07	.64			
	SES	.32**	3.05**			
	Education	-.11	-1.05	.093	.046	1.96
	Security	.34**	2.86**			
	Preoccupied	.03	.21			
	Avoidant	-.17	-1.24	.291***	.223	4.29***
					$\Delta R^2 = .198$***	

Note. **$p \leq .01$; ***$p \leq .001$.

Predicting Impulsivity by Using Attachment Coping Strategies with Mother-figure

Multiple regression analyses were conducted to investigate the predictive power of attachment coping strategies in impulsivity. Age, gender, SES and highest education level in the household were entered into the first step while security coping, preoccupied coping, and avoidant coping were entered into the second step of the regression analyses.

Results from hierarchical regression analysis (see Table 4.3) showed that the overall model was significantly different from zero, $F_{(7, 73)} = 3.00$, $p = .008$. Addition of attachment coping strategies improved the predictive power of impulsivity by 15.4%, [$\Delta R^2 = .154$, $F_{(3, 73)} = 4.82$, $p = .004$]. Out of all the predictor variables examined, only avoidant coping strategy ($\beta = .44$, $t = 3.08$, $p = .003$) contributed significantly to the prediction of impulsivity. That is, the variability in impulsivity was predicted by knowing scores on avoidant coping strategy, and one unit increase in impulsivity was associated with .44 unit increase in avoidant coping strategy. This suggests that individuals who were more avoidant in their coping strategy with their mother-figure had higher impulsivity. Age ($\beta = .09$, $t = .80$, $p = .43$, *n.s.*), gender ($\beta = .12$, $t = 1.09$, $p = .28$, *n.s.*), SES ($\beta = -.14$, $t = -1.23$, $p = .22$, *n.s.*), highest education level in the household ($\beta = .12$, $t = 1.09$, $p = .28$, *n.s.*), security coping ($\beta = -.01$, $t = -.10$, $p = .92$, *n.s.*) and preoccupied coping ($\beta = .08$, $t = .64$, $p = .53$, *n.s.*) were not significant predictors of impulsivity.

Table 4.3

Summary of Regression Analyses for Variables Predicting Impulsivity in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.09	.80			
	Gender	.12	1.09			
	SES	-.14	-1.23			
	Education	.12	1.09	.070	.021	1.43
	Security	-.01	-.10			
	Preoccupied	.08	.64			
	Avoidant	.44**	3.08**	.224**	.149	3.00**
					$\Delta R^2 = .154$**	

Note. **$p < .01$.

Predicting Health practices by Using Attachment Coping Strategies with Mother-figure

To test the contribution of attachment coping strategies in predicting health practices, multiple regression analyses were conducted. Age, gender, SES and highest education level in the household were entered into the first step. Security coping, preoccupied coping, and avoidant coping were entered into the second step of the regression analyses.

Results from hierarchical regression analysis (see Table 4.4) revealed that the overall model was significantly different from zero [$F_{(7, 73)} = 4.37$, $p = .000$] and accounted for 29.5% of the variance in health practices. Adding attachment coping strategies to the model significantly improved the predictive power of health practices by 19.1% [$\Delta R^2 = .191$, $F_{(3, 73)} = 6.61$, $p = .001$]. Avoidant coping ($\beta = -.35$, $t = -2.60$, $p = .01$) and SES ($\beta = .22$, $t = 2.06$, $p = .04$) were the two significant predictors of health practices while age ($\beta = -.12$, $t = -1.12$, $p = .27$, *n.s.*), gender ($\beta = .02$, $t = .21$, $p = .84$, *n.s.*), highest education level in the household ($\beta = .03$, $t = .31$, $p = .76$, *n.s.*), security coping ($\beta = .18$, $t = 1.53$, $p = .13$, *n.s.*), and preoccupied coping ($\beta = -.05$, $t = -.37$, $p = .71$, *n.s.*) did not significantly predict health practices. When all other predictor variables were controlled for, one unit increase in health practices was associated with .35 unit decrease in avoidant coping strategy, and .22 unit increase in SES respectively. The variability in health practices was predicted by knowing scores on avoidant coping and SES of the individuals. The size and direction of the relationships suggest that use of less avoidant coping strategy with mother-figure and higher SES were associated with more health practices.

Table 4.4

Summary of Regression Analyses for Variables Predicting Health practices in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	-.12	-1.12			
	Gender	.02	.21			
	SES	.22*	2.06*			
	Education	.03	.31	.104	.057	2.21
	Security	.18	1.53			
	Preoccupied	-.05	-.37			
	Avoidant	-.35*	-2.60*	.295***	.228	4.37***
						$\Delta R^2 = .191$***

Note. *$p < .05$; ***$p \leq .001$.

Predicting Risk-taking Behavior by Using Attachment Coping Strategies with Mother-figure

Multiple regression analyses were conducted to predict risk-taking behavior using attachment coping strategies. Age, gender, SES and highest education level in the household were entered into the first step whereas security coping, preoccupied coping, and avoidant coping were entered into the second step of the regression analyses.

Results (see Table 4.5) showed that the overall model was significantly different from zero [$F_{(7, 73)} = 2.95$, $p = .009$] and accounted for 22.1% of the variance in risk-taking behavior. Addition of attachment coping strategies to the model significantly improved the predictive power of risk-taking behavior by 14.2% [$\Delta R^2 = .142$, $F_{(3, 73)} = 4.43$, $p = .006$]. However, none of the predictor variables tested was individually useful in predicting risk-taking behavior in this study although the direction of the effect of avoidant coping was consistent with what we have predicted and that its predictive power was strongest among all the six predictor variables ($\beta = .23$, $t = 1.57$, $p = .12$, *n.s.*; more avoidant, more risk-taking behavior).

Table 4.5

Summary of Regression Analyses for Variables Predicting Risk-taking Behavior in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.06	.51			
	Gender	-.11	-1.00			
	SES	-.002	-.02			
	Education	.09	.81	.079	.030	1.62
	Security	-.18	-1.48			
	Preoccupied	-.09	-.65			
	Avoidant	.23	1.57	.221**	.146	2.95**
					$\Delta R^2 = .142$**	

Note. **$p < .01$.

Predicting First-move Latency in the Tower of London Task by Using Attachment Coping Strategies with Mother-figure

The first-move latency in the Tower of London task served as an indicator of participant's behavioral impulsivity and we used it as a reference to self-reported impulsivity.

To examine the predictive power of attachment coping strategies in first-move latency (behavioral impulsivity), age, gender, SES and highest education level in the household were entered into the first step of the regression analyses and security coping, preoccupied coping, and avoidant coping were entered into the second.

Results (see Table 4.6) showed that the overall model was significantly different from zero, $F_{(7, 73)} = 5.61, p = .000$. Addition of attachment coping strategies improved the predictive power of behavioral impulsivity by 8.9%, [$\Delta R^2 = .089, F_{(3, 73)} = 3.33, p = .024$]. Out of all the predictor variables examined, however, only age ($\beta = .30, t = 2.80, p = .007$) contributed significantly to the prediction of behavioral impulsivity. That is, the variability in behavioral impulsivity was predicted by knowing participants' age, and one unit increase in first-move latency was associated with .30 unit increase in age. This suggests that individuals who were older had longer first-move latency which means that it took older individuals longer time to start their first move after presentation of problems in the Tower of London task, thus, older individuals had lower behavioral impulsivity.

Table 4.6

Summary of Regression Analyses for Variables Predicting First-move Latency in the Tower of London Task (Behavioral Impulsivity) in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.30**	2.80**			
	Gender	-.15	-1.43			
	SES	-.05	-.50			
	Education	.12	1.20	.261***	.222	6.70***
	Security	.22	1.91			
	Preoccupied	-.22	-1.83			
	Avoidant	.18	1.37	.350***	.287	5.61***
						$\Delta R^2 = .089$*

Note. *$p < .05$; **$p < .01$; ***$p < .001$.

Predicting Delay Discounting by Using Attachment Coping Strategies with Mother-figure

The average indifference point in the Delay Discounting task measured participant's preference for a larger amount of hypothetical money granted in the future vs. a smaller amount of hypothetical money granted immediately. It served as a reference to self-reported future orientation.

To examine the effects of attachment coping strategies in the prediction of indifference point in the Delay Discounting task, age, gender, SES and highest education level in the household were entered into the first step of the regression analyses. Security coping, preoccupied coping, and avoidant coping were entered into the second step.

Results (see Table 4.7) showed that the overall model was not significantly different from zero, $F_{(7, 73)} = 1.76$, $p = .11$, *n.s.* None of the predictor variables in this model except gender ($\beta = .25$, $t = 2.09$, $p = .040$; female having a higher indifference point in the Delay Discounting task, thus, higher preference for larger amount of future hypothetical money) contributed significant predictive power to indifference point in the task.

Table 4.7

Summary of Regression Analyses for Variables Predicting Indifference Point in the Delay Discounting Task (Preference for Future Reward) in Study 2

Model	Predictor	Beta	t	R^2	R^2_{adj}	F
	Age	.08	.67			
	Gender	.25*	2.09*			
	SES	-.16	-1.40			
	Education	.17	1.53	.113	.066	2.42
	Security	.17	1.33			
	Preoccupied	-.11	-.81			
	Avoidant	.07	.46	.144	.062	1.76
					$\Delta R^2 = .031$	

Note. $*p < .05$.

To further test whether the relationships between attachment coping strategies and resource management strategies were age-sensitive, we divided participants' data in this study into two subsamples (aged 11 to 14 years as the first subsample, and aged 15 to 18 as the second subsample) that were more age homogenous and looked at how their correlations compared between subsamples and the whole sample. The correlations (Table 4.1) revealed that the associations between avoidant coping and future orientation, and between avoidant coping and risk-taking behavior were stronger in the 15 to 18 age group than that in the age-different whole sample of 11 to 18 years and that in the younger 11 to 14 age group. This suggested that there were differences between the correlations

obtained from the more age-homogeneous subsamples and those derived from the age-different whole sample.

4.4 Discussion

This study investigated the associations between attachment styles (styles of relating to mother-figure: security, preoccupied and avoidant styles) to mother-figure and resource management strategies in terms of future orientation, impulsivity, health practices, and risk-taking behavior using a multi-method approach with an age group different from that of Study 1. We have included mothers' report of the participants' attachment coping strategies in this study.

Findings in this study partly supported our hypotheses. That is, avoidant coping was useful in predicting impulsivity and health practices while security coping was useful in predicting future orientation. The association between avoidant coping and impulsivity was positive, meaning that individuals using more avoidant coping strategy were more impulsive. On the other hand, the association between avoidant coping and health practices was negative, suggesting that individuals with more avoidant coping strategy were less concerned about their health and engaged in healthy habits less frequently in their daily life. The association between future orientation and security coping with mother-figure was positive, showing that individuals who used more security coping with their mother-figure were more future-oriented. SES was useful in predicting future orientation and health practices but attachment coping styles could predict these two resource management strategies over and beyond SES even after the effect of SES was controlled for.

Our hypotheses that avoidant coping strategy could significantly predict risk-taking behavior and future orientation were not supported. In fact, none of the predictor variables in this study was useful in predicting risk-taking behavior. However, by dividing the data into two subsamples that were more age homogenous it was found that avoidant coping in the older 15 to 18 subsample had stronger correlations with future orientation and risk-taking behavior than that in the whole sample and in the younger 11 to 14 subsample. This suggested that the associations between avoidant coping and the two resource management strategies in future orientation and risk-taking behavior were age-sensitive.

Furthermore, attachment coping strategies were not significant predictors of the two resource management strategies measured by experimental tasks, namely behavioral index of future orientation and impulsivity. Rather, these two outcome variables of resource management strategies in behavioral future orientation and impulsivity measured by experimental tasks could only be predicted by participants' gender and age, respectively.

Chapter 5: General Discussion

In this research, we investigated the relationship between attachment with primary caregiver and resource management strategies in terms of future orientation, impulsivity, health concerns and health practices, bodily energy deficiency, risk-taking propensity and behavior, and buying tendency by conducting two studies using multi-methods and two different age groups (college students and adolescents). Results partly supported our hypotheses that attachment styles were useful predictors of resource management strategies. Avoidant attachment was found to be particularly predictive of resource management strategies in impulsivity, health concerns and practices, and risk propensity in our study. High level of avoidant attachment was found to be associated with higher impulsivity and risk propensity, but fewer health concerns and health practices.

According to our hypotheses which mainly based on attachment theory and life history theory of human development, avoidant attachment style was triggered by insensitive or rejecting parenting practice that was indicative of a resource-depleting and high-risk environment in ancestral past where survival demanded immediate attention. As a result, children living under such conditions ought to favor short-term survival and reproductive strategies by being more impulsive and taking more risks as these might bring in potential benefits and result in immediate positive outcomes that could be directed to reproductive success. They should not be spending time and effort to be concerned about their health and practicing healthy habits as the benefits of healthy practices often do not manifest immediately but take a longer time to pay off. These are some of the resource management strategies and life history tradeoffs that would have

adaptive value to children who learned of the harshness of the environment through their parents' insensitive or rejecting rearing practice. Findings on avoidant attachment and resource management strategies in impulsivity, health concerns and health practices, and risk propensity in this study were consistent with our hypotheses and lent initial support to what we have proposed.

The problems faced by humans living in high-risk resource-depleting environmental conditions concerned whether they could survive into the future in order to have offspring. This is critical life-and-death issue and so it is not surprising to find avoidant attachment stood out consistently as a prominent and significant predictor of resource management strategies in this study when compared to other attachment styles such as anxious and secure attachment. If these individuals living in such life threatening conditions had not developed adaptive resource management strategies to deal with the harshness in their life, they might die fast and leave no descendents.

Our results further indicated that more anxious individuals tended to perceive their bodily energy level to be in a greater deficient state and more securely attached individuals were more future-oriented. According to our hypotheses, anxious attachment was an adaptive strategy activated by inconsistent parenting that was resulted from an unpredictable resource-deficient environment in ancestral past. Children living under this condition ought to opt for a resource management strategy that was highly sensitive so that they could extract and accumulate resources as an adaptation to limited available resources and unstable environment. It is possible that the threshold of bodily energy level for anxious individuals is higher than that of individuals with other attachment styles. Thus, it is not the objective energy level but rather the perceived level that is more

relevant. By being sensitive and perceiving their bodily energy level as low, these individuals can be constantly assessing and be alert of their deficiency in bodily energy level which motivates them to continue extracting and accumulating more energy.

On the other hand, secure attachment was likely to be an adaptive strategy in response to consistent and supportive parenting practice indexing a predictable resource-abundant environment. Under these conditions life history tradeoffs would favor resource management strategies that take future into account as survival is not likely to be an immediate concern in a stable resource-abundant environment. Being future-oriented and investing into the future in lieu of the immediate present would be an adaptive strategy for secure individuals because there will likely be a future to expect and sacrificing the immediate present for a better future could improve the quality of their offspring. These results were consistent with our hypotheses and provided support to the life history theory in which our hypotheses were based on.

These patterns of resource management strategies and attachment styles to primary caregivers existed possibly because as proposed by life history and evolutionary theories child rearing patterns expressed by caregivers early on conveyed to the child information about the environment in which they were and would likely be habiting, therefore, triggering particular adaptive strategies (attachment style and resources management style) that were optimal for that specific environment: whether it was a high resource, low-risk environment where a relaxed style of resource management was an optimal strategy (secure attachment); a low resource, unpredictable environment where sensitivity to and accumulation of resources were the best possible strategies in managing resources

(anxious attachment); or a resource-depleted, high-risk environment where immediate, carefree style of resource management was favored (avoidant attachment).

SES is closely related to resource availability. According to evolutionary and life history theories of human development, attachment styles were adaptive mechanism developed in response to parenting practice indicative of environmental risk and resource availability in ancestral past that were relatively unchanging. However, in contemporary societies parenting styles might not be the actual index of environmental risk and uncertainty yet attachment styles (being an adaptive mechanism designed to solve ancestral problems by adjusting life history strategies to best adapt to external living conditions that was relatively unchanged) still respond to parenting styles even though these parenting styles may not necessarily be an actual reflection of environmental conditions. In fast changing modern societies, it is possible that even though the environmental conditions are predictable and low in risk with abundant resources, parenting style can still be inconsistent or even unresponsive due to contemporary demands such as busy working and traveling schedules or mental illnesses that are more common in contemporary life than in ancestral past. Since SES is expected to be related to resources, we controlled the effect of SES in the regression analyses in this research to examine how attachment styles predicted resource management strategies over and beyond SES. Significant results of the predictive power of attachment styles over and above SES lent initial support to the usefulness of attachment styles as an adaptive mechanism solving ancestral problems. Future research can further explore and address this issue.

Results from this research did not fully support all of the hypotheses. The hypothesized effect of avoidant attachment on buying tendency did not emerge. Although the results were in the hypothesized direction (i.e., more avoidant individuals were likely to buy impulsively than less avoidant individuals were), avoidant attachment was not a strong enough predictor of buying tendency in the regression model. One possible reason accounting for this may be that the buying tendency of avoidant individuals was target-specific rather than general. Perhaps there are certain categories of material goods that are of particular interest to avoidant individuals that are not easily tapped into by a general measure of buying tendency. It is also possible that avoidant individuals tend to act on the spur of the moment when they are buying and so their actual buying behavior may be more prominent than their self-reported buying tendency. This possibility can be tested by including participants' daily buying habits into the analyses and/or measuring their buying behavior in controlled experiments in future studies.

Result of avoidant attachment in the prediction of risk-taking behavior was not significant. For risk-taking behavior, adolescent participants were asked to report the number of times they had engaged in activities such as drinking alcohol, vandalizing property, riding in a car with a drunk driver, smoking cigarettes, having unprotected sex, stealing from a store, getting into a physical fight, going into a dangerous part of town, and threatening or injuring someone with a weapon. Perhaps to participants aged 11 to 18, especially those that were in the younger age group, chances of them being exposed to some of these risky activities might not be high. Correlations from two subsamples divided by age (11 to 14 years old and 15 to 18 years old) revealed that avoidant attachment had stronger correlation with risk-taking behavior in participants of the older age group. This provides

some initial support to our speculations that the engagement in risk-taking behaviors could be age-sensitive and that exposure to the risky activities assessed in this study might be low for the younger age group. We need to recruit more participants from wider age groups to test these out. It is also possible that adolescents in China are in general better behaved and engage in fewer risky activities. This potentiality can be examined by including risky activities from wider or more adolescent-relevant categories or asking participants to nominate the kind of risky activities they engage in and incorporating other experimental tasks into future studies to augment the scope of risk taking assessment. Participants from different cultures can also be recruited to make comparison of their risk-taking behaviors.

Results from the two experimental tasks measuring behavioral impulsivity (time to first move in the Tower of London task) and delay discounting (preference for future orientation) in study 2 did not converge with our hypotheses. None of the attachment coping styles was predictive of behavioral impulsivity and delay discounting in our study with adolescents. According to the results of these two tasks, only participants' age and gender were predictive of behavioral impulsivity and delay discounting, respectively. Older participants took longer time to make their first move and were thus less impulsive while females had higher preference for future orientation. It is possible that in this age group (ranging from 11 to 18 years old) the variability in behavioral impulsivity is larger than that in other age groups. As Steinberg et al. (2008) reported, participants' behavioral impulsivity did not declined as a function of age before they reached age 16 but their impulsivity significantly decreased from age 16 onwards and continued into mid-20s. As a result, age might be a much more significant

predictor of behavioral impulsivity than attachment styles in this task. Furthermore, participants' cognitive variability due to their age could also be a contributing factor in this significant age finding. These possibilities can be tested in future studies by including participants from a wider age group (from childhood all the way to the elderly) and including data of participants' cognitive ability so that the effects of age and cognitive ability could be examined and compared.

For the non-significant effect of attachment styles on the Delay Discounting task indexing future orientation, we proposed that perhaps adolescent participants were not sensitive enough to monetary rewards or that monetary rewards were not something of high interest to them in this age group. Alternatively, perhaps the monetary rewards in this Delay Discounting task were only hypothetical and no real money would be rewarded to them in reality. Consequently, the outcome was not significantly associated with attachment styles as the task to these adolescents might not be related to resource management. Answers to these possibilities can be obtained by running this task with adult participants and/or offer rewards that are of high relevance or interest to the target participants in future studies.

Not only were the associations between attachment styles and the two behavioral measures of future orientation and impulsivity non-significant, but convergent associations between the behavioral measures and self-report measures of impulsivity and future orientation in study two did not exist. Based on the correlations between self-reported future orientation and behavioral preference for future orientation, their relationship was close to zero ($r = .04$), and the correlation between self-reported impulsivity and time to first move measured by the Tower of London task indexing behavioral impulsivity was even positive (r

= .18; opposite to the supposedly negative correlation) in this study. If the self-report measures and behavioral measures by experimental tasks were assessing the same constructs using two different approaches, the correlations should converge to a moderate degree. That is, self-reported future orientation and behavioral preference in future orientation measured by the delay discounting task should be positively correlated to a moderate degree with each other, and self-reported impulsivity and time to first move in the Tower of London task indexing behavioral impulsivity should be negatively correlated to a moderate degree (i.e., higher self-reported impulsivity, shorter time to first move in the Tower of London task). However, such moderate convergent correlations were not found in this study, pointing to the possibility that the self-report measures of impulsivity and future orientation may not be assessing the same properties of these two constructs as that measured by the two behavioral experimental tasks. This could be due to the variations in sensitivity between self-report and experimental task measures. More comprehensive and convergent self-report and experimental measures are needed to assess these resource management strategies in future orientation and impulsivity in future studies.

For the hypothesized effects of attachment styles and resource management strategies that were not significant – especially for the ones that showed significant correlations in the hypothesized directions, it is possible that our sample sizes were not large enough for the results to reach statistically significant level. Therefore, more participants can be recruited in future studies to examine the effects of attachment styles on resource management strategies.

The percentage of variance explained in resource management strategies by attachment styles to mother-figure in study one with adult college students

were lower than that accounted for by attachment styles to mother-figure in study two with adolescent school student. As previous research has shown, individuals can form multiple attachments with people other than their mother-figure (Lewis, 1994), especially as individuals age. The effects of attachment with mother-figure in childhood may gradually recede. Other intervening factors such as peer influence, romantic relationships, personal experiences and environmental influence may also moderate the effect of early attachment on resource management strategies by adolescence or early adulthood. Although the internal working models of attachment styles are relatively stable, during the course of human development revisions are possible due to influence of individual relationships and experiences (Owens et al., 1995; van IJzendoorn, 1995; Waters et al., 2000). Adult attachment for individuals who have formed pair bonding with romantic partners can also take precedence over early attachment with mother-figure (Hazan & Shaver, 1994b). Thus, we will need to obtain information about participants' dating status to further investigate the influence of adult attachment in future studies. This combination of factors could be possible reasons explaining why some of the results in this research did not show significant effects of attachment styles to mother-figure on resource management strategies in adolescence and early adulthood.

Another possible reason for the non-significant results could be explained by specific cohort effects. Participants in both study one and study two were mostly single children in their families due to the one-child policy in china. Single-child families are relatively better able to provide more resources to their children and these single children can enjoy a lot more resources from their

families in general. Perhaps the participants in these studies are single children who have a lot of resources and thus the reason for the non-significant results.

No one research is able to address all the questions. In future studies, more participants from different age groups and diverse family background can be recruited. More experimental tasks, observational data, as well as data from accurate report of daily-life behaviors and habits can be included in order to pin down and/or rule out possible confounding factors so that a more comprehensive picture of the relationship between attachment styles and resource management strategies can be obtained.

Implications

As revealed by the findings in our studies, attachment styles and resource management strategies were significantly related. According to evolutionary and life history theories of human development (Belsky, 1997; Belsky et al., 1991; Chisholm, 1993, 1996, 1999; Daly & Wilson, 2005; Draper & Harpending, 1982; Hill et al., 1997), the major problems for organisms including humans to be solved are survival and reproduction, i.e., inclusive fitness. Humans evolved to reproduce and have offspring rather than to maximize their own health and lifespan if these are not serving the ultimate goal of having descendants. As these theories go, the different attachment styles and resource management strategies should be adaptive to particular socioecology. Some of the people in our society may consider insecure attachment styles, high risk taking, opting for the immediate rather than the future, high impulsivity, and lack of concern for health and healthy habits to be undesirable personal traits. However, these traits are adaptive tradeoffs and strategies triggered early on in response to the particular

environmental conditions, developmental trajectories, and socioecology individuals experience in their life. They are more of the biopsychological responses to the environment rather than "human" decisions. Taking individuals' background socioecological factors into account, these presumably undesirable traits are not so "negative" after all. There are no "good/bad" attachment styles or resource management strategies. They evolved to solve the different problems faced by individuals living in different socioecology. Hence, insecure attachment should not be regarded as inferior to secure attachment even though society at large values secure attachment over insecure attachment.

If we were to avoid/alleviate the social problems particular strategies bring about when imbalanced, effort should be devoted to preventive measures in which intervention and support resources should start very early on in a child's life or even by improving the overall conditions of the family before a child is born. Emphasizing and promoting the important impact of parenting practice on a child's attachment and resource management strategies, and providing parenting education can be effective in lowering such imbalances. As pointed by Chisholm (1999) life history theory and tradeoffs in human development can be informative to policymakers so that they see to it the importance of reducing risk and uncertainty through the promotion of equality (Marris, 1991; Sen, 1993) in modern societies in order to solve or prevent relevant social problems. Besides, previous research (van IJzendoorn, 1995) has discovered that attachment styles of children were likely to be the same as that of their mothers. That is, secure mothers were more likely to raise secure children while insecure mothers were more likely to raise insecure children. Therefore, by reducing social inequality, risk and uncertainty in individuals' life decrease, parenting practice can then be

more responsive and supportive, lowering insecure attachment in children and thus, resource management strategies that are not conflicting with social well-being. This can help break the insecure recurring cycle. Reducing uncertainty and risk in individuals' life can also help to improve their health as they will become more aware and concerned about their health and practice more healthy habits. This not only improves the overall well-being of citizens but also reduces the cost and stress on medical care services.

Since attachment styles were found to be related and predictive of resource management strategies, assessing people's attachment styles can serve as useful information to service providers of counseling and support services and gain insights into the understanding of their clients' problems. In addition, knowing people's attachment styles, particularly that of younger individuals, can provide advance information for early intervention programs to target the audience for delivery of preventive measure promotion.

Limitations and Future Directions

There are several limitations in the present studies that warrant cautious attention. Firstly, our data was mainly correlational in nature although there were two experimental tasks included in this research. Therefore, no causal inferences can be drawn. Secondly, most of the data was obtained from self report and so it bears all the shortcomings of self-report studies. Thirdly, attachment was assessed through participants' and their mothers' retrospection of their childhood attachment styles which might not necessarily be an accurate recall.

Future research can examine the relationship between attachment and resource management strategies in well-controlled laboratory settings, e.g.,

controlling the attachment of participants by priming the different attachment styles and including more experimental tasks to measure actual behaviors and decisions in resource management strategies. Moreover, participants in our studies were mainly from middle class families, their developmental background and parenting practice were unknown to us. Stronger support can be drawn from future studies which include samples from early at-risk population and participants raised with different parenting styles from extremely high to extremely low SES populations, something similar to manipulating the environmental conditions of participants but in real, natural settings. This would be useful in establishing and examining part of the missing link between the proposed unpredictable resource-depleted environment vs. a stable resource-abundant environment and the different attachment styles which are difficult to get at otherwise. In addition, future studies can incorporate the use of multiple convergent measures and experimental tasks of attachment and resource management strategies with participants from different age groups to supplement the scales and tasks used in these present studies, e.g., assessing attachment styles of participants through observations, interviews and priming technique and using more than one experimental tasks to assess each of the resource management strategies to cross-check their sensitivity and accuracy. Conducting longitudinal studies and keeping detailed track records of participants' developmental trajectories as well as their parents' rearing practices for further analyses will also be promising.

Despite these limitations, the present studies extend our knowledge by showing that attachment styles are useful in the prediction of resource management strategies such as impulsivity, risk propensity, future orientation,

health concerns and practices, and bodily energy deficiency. These findings can provide useful information for practitioners to target potential at-risk populations, and to set up and promote preventive measure programs. Furthermore, this research has integrated an evolutionary approach in explaining the relationship between attachment styles and resource management strategies and their adaptive value that are worth considering if we were to gain a more comprehensive understanding of the different resource management strategies people are using.

References

Ainsworth, M. D. S. (1962). The effects of maternal deprivation: A review of findings and controversy in the context of research strategy. In *Deprivation of maternal care: A reassessment of its effects* (Public Health Papers, No. 14, pp. 97-165). Geneva, Switzerland: World Health Organization.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Walls, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation.* Hillsdale, NJ: Erlbaum.

Alexander, R. D. (1989). Evolution of the human psyche. In P. Mellars & C. Stringer (Eds.), *The human revolution* (pp. 455-513). Chicago: University of Chicago Press.

Amodio, D. M., & Frith, C. D. (2006). Meeting of minds: The medial frontal cortex and social cognition. *Nature Reviews Neuroscience, 7*, 268-277.

Asato, M., Sweeney, J., & Luna, B. (2006). Cognitive processes in the development of TOL performance. *Neuropsychologia, 44*, 2259–2269.

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development, 55*, 83-96.

Belsky, J. (1997). Attachment, mating, and parenting: An evolutionary interpretation. *Human Nature, 8*, 361-381.

Belsky, J. (2007). Childhood Experiences and Reproductive Strategies. In R. Dunbar & L. Barrett (Eds.), *Oxford Handbook of evolutionary psychology* (pp. 237-254). Oxford, UK: Oxford University Press.

Belsky, J., Steinberg, L., & Draper, P. (1991). Childhood experience, interpersonal development, and reproductive strategy: An evolutionary theory of socialization. *Child Development, 62*, 647-670.

Benthin, A., Slovic, P., & Severson, H., (1993). A psychometric study of adolescent risk perception. *Journal of Adolescence, 16*, 153-168.

Berg, W., & Byrd, D. (2002). The Tower of London spatial problem solving task: Enhancing clinical and research implementation. *Journal of Experimental and Clinical Neuropsychology, 25*, 586-604.

Bjorklund, D. F., & Bering, J. M. (2003). Big brains, slow development, and social complexity: The developmental and evolutionary origins of social cognition. In M. Brüne, H. Ribbert, & W. Schiefenhövel (Eds.), *The social brain: Evolutionary aspects of development and pathology* (pp. 133-151). New York: Wiley.

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment.* New York: Basic Books.

Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation: Anxiety and anger.* New York: Basic Books.

Bowlby, J. (1980). *Attachment and loss: Vol. 3. Loss: Sadness and depression.* New York: Basic Books.

Brennan, K. A., & Shaver, P. R. (1998). Attachment styles and personality disorders: Their connections to each other and to parental divorce, parental death, and perceptions of parental caregiving. *Journal of Personality, 66*, 835-878.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult romantic attachment: An integrative overview. In J. A. Simpson & W.

S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.

Bretherton, I. (1992). The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental Psychology, 28*, 759-775.

Bromiley, P., & Curley, S. P. (1992). Individual differences in risk taking. In J. F. Yates (Ed.), *Risk-Taking Behavior* (pp. 87-132). Chichester, England: Wiley.

Burgess, R., & Draper, P. (1989). The explanation of family violence: The role of biological behavioral and cultural selection. In L. Ohlin & M. Tonry (Eds.), *Family violence* (pp. 59-116). Chicago: University of Chicago Press.

Buss, D. M. (1995). Evolutionary psychology: A new paradigm for psychological science. *Psychological Inquiry, 6*, 1-30.

Buss, D. M. (2004). *Evolutionary psychology: The new science of the mind.* Boston: Allyn & Bacon.

Campos, J. J., Barrett, K., Lamb, M. E., Goldsmith, H., & Stenberg, C. R. (1983). Socioemotional development. In M. M. Haith & J. J. Campos (Eds.), *Handbook of child psychology: VoL 2. Infancy and developmental psychobiology* (pp. 783-915). New York: Wiley.

Carnelley, K. B., Pietromonaco, P. R., & Jaffe, K. (1994). Depression, working models of others, and relationship functioning. *Journal of Personality and Social Psychology, 66*, 127-140.

Cauffman, E., & Woolard, J. (1999). *Future outlook inventory.* Unpublished test.

Chapman, B. B., Morrell, L. J., & Krause, J. (2010). Unpredictability in food supply during early life influences boldness in fish. *Behavioral Ecology, 21*, 501-506.

Chervin, R. D. (2000). Sleepiness, fatigue, tiredness, and lack of energy in obstructive sleep apnea. *Chest, 118*, 372-379.

Chisholm, J. S. (1993). Death, hope, and sex: Life-history theory and the development of reproductive strategies. *Current Anthropology, 34*, 1-24.

Chisholm, J. S. (1996). The evolutionary ecology of attachment organization. *Human Nature, 7*, 1-38.

Chisholm, J. S. (1999). Attachment and time preference: Relations between early stress and sexual behavior in a sample of American university women. *Human Nature, 10*, 51-83.

Chisholm, J. S., Quinlivan, J. A., Petersen, R. W., & Coall, D. A. (2005). Early stress predicts age at menarche and first birth, adult attachment, and expected lifespan. *Human Nature, 16(3)*, 233-265.

Clutton-Brock, T. H. (1991). *The evolution of parental care*. Princeton (NJ): Princeton University Press.

Cohn, D. A. (1990). Child-mother attachment of six-year-olds and social competence at school. *Child Development, 61*, 152-162.

Collins, N. L., & Allard, L. M. (2001). Cognitive representations of attachment: The content and function of working models. In G. J. O. Fletcher & M. S. Clark (Eds.), *Blackwell handbook of social psychology: Vol. 2. Interpersonal processes* (pp. 60-85). Malden, MA: Blackwell.

Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of Personality and Social Psychology, 58,* 644-663.

Collins, W. A., & Sroufe, L. A. (1999). Capacity for intimate relationships: A developmental construction. In W. Furman (Ed.), *The development of romantic relationships in adolescence* (pp. 125-147). Cambridge: Cambridge University Press.

Cosmides, L., & Tooby, J. (1987). From evolution to behavior: Evolutionary psychology as the missing link. In J. Duprd (Ed.), *The latest on the best: Essays on evolution and optimality* (pp. 277-306). Cambridge, MA: MIT Press.

Daly, M., & Wilson, M. (2005). Carpe diem: Adaptation and devaluing the future. *The Quarterly Review of Biology, 80,* 55-60.

Del Giudice, M. (2009). Sex, attachment, and the development of reproductive strategies. *Behavioral and Brain Sciences, 32,* 1-67.

DeMulder, E. K., Denham, S., Schmidt, M., & Mitchell, J. (2000). Q-sort assessment of attachment security during the preschool years: Links from home to school. *Developmental Psychology, 36(*2), 274-282.

Dickman, S. J. (1990). Functional and dysfunctional impulsivity: Personality and cognitive correlates. *Journal of Personality and Social Psychology, 58,* 95-102.

Draper, P., & Harpending, H. (1982). Father absence and reproductive strategy: An evolutionary perspective. *Journal of Anthropological Research, 38,* 255-273.

Egeland, B., & Farber, E. A. (1984). Infant-mother attachment: Factors related to its development and changes over time. *Child Development, 55*, 753-771.

Ellis, B. J. (2004). Timing of pubertal maturation in girls. *Psychological Bulletin, 130*, 920-958.

Etzioni, A. (1986). Rationality is anti-entropic. *Journal of Economic Psychology, 7*, 17-36.

Feeney, J. A. (1999). Adult romantic attachment and couple relationships. In J. A. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 355-377). New York: Guilford Press.

Figueredo, A. J., Va´squez, G., Brumbach, B., Schneider, S. M. R., Sefcek, J. A., Tal, I. R., Hill, D.,Wenner, C. J. & Jacobs, W. J. (2006). Consilience and life history theory: From genes to brain to reproductive strategy. *Developmental Review, 26*, 243-275.

Finnegan, R. A., Hodges, E. V. E., & Perry, D. G. (1996). Preoccupied and avoidant coping during middle childhood. *Child Development, 67*, 1318-1328.

Flinn, M. V., Geary, D. C., & Ward, C. V. (2005). Ecological dominance, social competition, and coalitionary arms races: Why humans evolved extraordinary intelligence. *Evolution and Human Behavior, 26*, 10-46.

Flinn, M. V., Quinlan, R. J., Coe, K., & Ward, C. V. (2007). Evolution of human family: cooperative males, long social childhoods, smart mothers, and extended kin networks. In C. Salmon & T. Shackelford (Eds.), *Family relationships: An evolutionary perspective* (pp. 16-38). New York: Oxford University Press.

Franzoi, S. L. (1995). The body-as-object versus the body-as-process: Gender differences and gender considerations. *Sex Roles, 33*, 417-437.

Furby, L., & Beyth-Maron, R. (1992). Risk taking in adolescence: A decision-making perspective. *Developmental Review, 12*, 1-44.

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*, 148-162.

Gardner, W. (1993). A Life-Span Rational-Choice Theory of Risk Taking. In N. J. Bell & R. W. Bell (Eds.), *Adolescent Risk Taking* (pp. 66-83). Newbury Park: Sage.

Gardner, W., & Herman, J. (1991). Adolescents' AIDS risk taking: A rational choice perspective. In W. Gardner, S. Mielstein, & B. Wilcox (Eds.), *Adolescents in the AIDS Epidemic* (pp. 17-34). San Francisco: Jossey-Bass.

Geary, D. C. (2005). Evolution of paternal investment. In D. M. Buss (Eds.), *The evolutionary psychology handbook* (pp. 483–505). Hoboken, NJ: John Wiley & Sons.

Gubernick, D. J. (1981). Parent infant attachment in mammals. In D. J. Gubernick & P. H. Klopfer (Eds.), *Parental Care in Mammals* (pp. 244-305). New York: Plenum Press.

Harter, S. (1982). The perceived competence scale for children. *Child Development, 53*, 87-97.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of Personality and Social Psychology, 52(3)*, 511-524.

Hazan, C., & Shaver, P. (1994a). Attachment as an organizational framework for research on close relationships. *Psychological Inquiry, 5*, 1-22.

Hazan, C., & Shaver, P. (1994b). Deeper into attachment theory: Reply to commentaries. *Psychological Inquiry, 5*, 68-79.

Hewes, G. W. (1961). Food transport and the origin of hominid bipedalism. *American Anthropologist, 63*, 687-710.

Hill, E., Ross, L., & Low, B. (1997). The role of future unpredictability in human risk-taking. *Human Nature, 97*, 287–325.

Hrdy, S. B. (1999). *Mother nature: A history of mothers, infants and natural selection*. New York: Pantheon Books.

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*, 703–710.

Jacobsen, T., Huss, M., Fendrich, M., Kruesi, M. J. P., & Ziegenhain, U. (1997). Children's ability to delay gratification: Longitudinal relations to mother-child attachment. *Journal of Genetic Psychology, 158*, 411-426.

Kaplan, H. S., & Robson, A. J. (2002). The emergence of humans: The coevolution of intelligence and longevity with intergenerational transfers. *Proceedings of the National Academy of Sciences, 99*, 10221-10226.

Kerns, K. A., Tomich, P. L., Aspelmeier, J. E., & Contreras, J. M. (2000). Attachment-based assessments of parent-child relationships in middle childhood. *Developmental Psychology, 36*, 614-626.

Kirkpatrick, L. A., & Davis, K. E. (1994). Attachment style, gender, and relationship stability: A longitudinal analysis. *Journal of Personality and Social Psychology, 66*, 502-512.

Kobak, R., & Hazan, C. (1991). Attachment in marriage: The effects of security and accuracy of working models. *Journal of Personality and Social Psychology, 60*, 861-869.

Korpimäki, E., Lahti, K., May, C. A., Parkin, D. T., Powell, G. B., Tolonen, P., & Wetton, J. H. (1996). Copulatory behaviour and paternity determined by DNA fingerprinting in kestrels: Effects of cyclic food abundance. *Animal Behaviour, 51*, 945-955.

Laaksonen, T., Fargallo, J. A., Korpimäki, E., Lyytinen, S., Valkam, J., & Pöyri, V. (2004). Year- and sex-dependent effects of experimental brood sex ratio manipulation on fledging condition of Eurasian kestrels. *Journal of Animal Ecology, 73*, 342-352.

Leigh, B. C. (1999). Peril, chance, and adventure: Concepts of risk, alcohol use and risky behavior in young adults. *Addiction, 94*, 371-383.

Lempers, J., Clark-Lempers, D., & Simons, R. (1989). Economic hardship, parenting and distress in adolescence. *Child Development, 60*, 25-49.

Levine, S. (1980). A coping model of mother-infant relationships. In S. Levine & H. Ursin (Eds.), *Coping and health* (pp. 87-99). New York: Plenum.

Lewis, M. (1994). Does attachment imply a relationship or multiple relationships? *Psychological Inquiry, 5*, 47-51.

Lorenz, K. Z. (1935). Der Kumpan in der Umwelt des Vogels [The companion in the bird'sworld]. *Journal fur Ornithologie, 83*, 137-213. (Abbreviated English translation published1937 in *Auk, 54*, 245-273.

Lovejoy, C. O. (1981). The Origin of Man. *Science, 211*, 341-350.

Marris, P. (1991). The social construction of uncertainty. In C. Parkes, J. Stevenson-Hinde & P. Marris (Eds.), *Attachment across the life cycle*, (pp. 77-90). London: Routledge.

McKinley, N. M., & Randa, L. A. (2005). Adult attachment and body satisfaction: An exploration of general and specific relationship differences. *Body Image, 2*, 209-218.

Mikulincer, M. (1995). Attachment style and he mental representation of the self. *Journal of Personality and Social Psychology, 69,* 1203-1215.

Mikulincer, M., & Florian, V. (1998). The relationship between adult attachment styles and cognitive reaction to stressful events. In J. A. Simpson & W. S. Rholes (Eds.), *Attachment theory and close relationships* (pp. 143-165). New York: Guilford Press.

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. New York: Guilford Press.

Mischel, W., Shoda, Y., & Peake, P. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology, 54*, 687-696.

Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 255*, 933-938.

Owens, G., Crowell, J., Pan, H., Treboux, D., O'Connor, E., & Waters, E. (1995). The prototype hypothesis and the origins of attachment working models: Adult relationships with parents and romantic partners. In E. Waters, B. Vaughn, G. Posada, & K. Kondo-Ikemura (Eds.), *Caregiving, cultural and cognitive perspectives on secure-base behavior and working models: New*

growing points of attachment theory and research (pp. 216-233). Chicago: University of Chicago Press.

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology, 51*, 768-774.

Pianka, E. R. (1970). On r- and K-selection. *American Naturalist, 104*, 592-596.

Pianta, R. C., Nimetz, S. L., & Bennett, E. (1997). Mother-child relationships, teacher-child relationships, and school outcomes in preschool and kindergarten. *Early Childhood Research Quarterly, 12*, 263-280.

Pinker, S. (1994). *The language instinct.* New York: William Morrow.

Quinlan, R. J. (2007). Human parental effort and environmental risk. *Proceedings of the Royal Society B: Biological Sciences, 274*, 121-125.

Rodriguez, M. L., Mischel, W., & Shoda, Y. (1989). Cognitive person variables in the delay of gratification of older children at risk. *Journal of Personality and Social Psychology, 57*, 358-367.

Rohrmann, B. (2005). *Risk Attitude Scales: Concepts, Questionnaires, Utilizations* (Project Report – University of Melbourne, Australia). Retrieved from http://www.rohrmannresearch.net/pdfs/rohrmann-racreport.pdf.

Rook, D. W. (1987). The buying impulse. *Journal of Consumer Research, 14*, 189-99.

Rosenberg, K., & Trevanthan, W. (2002). Birth, obstetric and human evolution. *British Journal of Obstetrics and Gynaecology, 109*, 1199-1206.

Rosenblum, L. A., & Paully, G. S. (1984). The effects of varying environmental demands on maternal and infant behavior. *Child Development, 55*, 305-314.

Rushton, J. P. (1985). Differential K theory: The sociobiology of individual and group differences. *Personality & Individual Differences, 6(4)*, 441-452.

Sen, A. (1993). The economics of life and death. *Scientific American, May*, 40-47.

Shaver, P., & Hazan, C. (1993). Adult romantic attachment. In D. Perlman & W. Jones (Eds.), *Advances in personal relationships* (Vol. 4, pp.29-70). London: Jessica Kingsley.

Silvera, D. H., Lavack, A. M., & Kropp, F. (2008). Impulse buying: The role of affect, social influence, and subjective wellbeing. *Journal of Consumer Marketing, 25*, 23-33.

Simpson, J. A. (1990). Influence of attachment styles on romantic relationships. *Journal of Personality and Social Psychology, 59*, 971-980.

Simpson, J. A., & Belsky, J. (2008). Attachment theory within a modern evolutionary framework. In P. R. Shaver & J. Cassidy (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 131-157). New York: Guilford.

Simpson, J. A., & Rholes, S. (2004). Anxious attachment and depressive symptoms: An interpersonal perspective. In W. S. Rholes, & J. A. Simpson (Eds.), *Adult attachment: Theory, research, and clinical implications* (pp.408-438). New York: The Guilford Press.

Simpson, J. A., Rholes, W. S., & Phillips, D. (1996). Conflict in close relationships: an attachment perspective. *Journal of Personality and Social Psychology, 71*, 899-914.

Simpson, J. A., Collins, W. A., Tran, S. S., & Haydon, K. C. (2007). Attachment and the experience and expression of emotions in romantic relationships:

A developmental perspective. *Journal of Personality and Social Psychology, 92,* 355-367.

Sroufe, L. A., Egeland, B., & Carlson, E. (1999). One social world: The integrated development of parent-child and peer relationships. In W.A. Collins & B. Laursen (Eds.), *Minnesota Symposia on Child Psychology: Vol. 30. Relationships as developmental contexts: Festschrift in honor of Willard W. Hartup* (pp. 241-261). Mahwah, NJ: Erlbaum.

Sroufe, L. A., Carlson, E., Levy, A., & Egeland, B. (1999). Implications of attachment theory for developmental psychopathology. *Development and Psychopathology, 11*, 1-13.

Sroufe, L. A., Egeland, B., Carlson, E., & Collins, A. (2005). Placing early attachment experiences in developmental context: The Minnesota longitudinal study. In K. Grossmann, K., Grossmann, & E. Watters (Eds.), *Attachment from infancy to adulthood: The major longitudinal studies* (pp.48-70). New York: The Guildford Press.

Stein, R. A. (1977). Selective predation, optimal foraging, and the predator-prey interaction between fish and crayfish. *Ecology, 58*, 1237-1253.

Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., & Woolard, J. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. *Developmental Psychology, 44*, 1764-1778.

Stearns, S. (1992). *The evolution of life histories.* Oxford: Oxford University Press.

Steinberg, L., Graham, S., O'Brien, L., Woolard, J., Cauffman, E., & Banich, M. (2009). Age differences in future orientation and delay discounting. *Child Development, 80*, 28–44.

Strathman, A., Gleicher, F., Boninger, D., & Edwards, C. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology*, 66, 742–752.

Tanner, N. M. (1981). *On Becoming Human*. Cambridge: Cambridge University Press.

Tolmacz, R. (2004). Attachment style and willingness to compromise when choosing a mate. *Journal of Social and Personal Relationships, 21*(2), 267-272.

Trimpop, R. M. (1994). *The psychology of risk-taking behavior*. Textbook Series: Advances In Psychology No. 107. Amsterdam: Elsevier.

van IJzendoorn, M. H. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the Adult Attachment Interview. *Psychological Bulletin, 117*, 387-403.

Vergara, P., Fargallo, J. A., & Martínez-Padilla, J. (2010). Reaching independence: Food supply, parent quality, and offspring phenotypic characters in kestrels. *Behavioral Ecology, 21(3)*, 507-512.

Verplanken, B., & Herabadi, A. (2001). Individual differences in impulse buying tendency: feeling and no thinking. *European Journal of Personality, 15*, S71–S83.

Wardle, J., & Steptoe, A. (1991). The European Health and Behavior Survey: Rationale, methods and initial results from the United Kingdom. *Social Science and Medicine, 33*, 925-936.

Waters, E., & Cummings, M.E. (2000). A secure base from which to explore close relationships. *Child Development, 71*, 164–172.

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development, 71*, 684-689.

Weber, E. U., Blais, A., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making, 15*, 263-290.

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology, 90*, 202-209.

Whiteside, S. P., & Lynam, D. R. (2001). The Five-Factor Model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*, 669–689.

Wilson, M., & Daly, M. (1997). Life expectancy, economic inequality, homicide, and reproductive timing in Chicago neighbourhoods. *British Medical Journal, 314*, 1271-1274.

Youngblade, L., & Belsky, J. (1990). The social and emotional consequences of child maltreatment. In R. Ammerman & M. Herson (Eds.), *Children at risk: An evaluation of factors contributing to child abuse and neglect*. New York: Plenum.