Attachment in infancy and personal space regulation in early adolescence

YAIR BAR-HAIM, ORA AVIEZER, YAIR BERSON and ABRHAM SAGI

ABSTRACT This study longitudinally assessed associations between secure and ambivalent attachment with mothers, fathers and professional caregivers in infancy, and personal space regulation and perceived interpersonal competence in 64 early adolescents (31 boys, 33 girls). Children classified as ambivalently attached to their mothers and/or professional caregivers in infancy displayed significantly larger permeability of personal space as compared with children classified as securely attached. Attachment classifications with fathers were not associated with personal space behavior at 12 years of age. Children who had an insecure attachment relationship with both the mother and the professional caregiver in infancy displayed smaller personal space boundaries, and tolerated larger intrusions into their personal space as compared with children who had two secure attachments in infancy. Finally, perceived interpersonal competence was positively correlated with personal space permeability.

KEYWORDS: attachment – personal space – intimacy – longitudinal – father

INTRODUCTION

The importance of spatial factors in human social and emotional behavior has been extensively reported by studies in the fields of ethology, sociology, anthropology and social psychology (for seminal reviews see Goffman, 1971; Hall, 1966; Sommer, 1969; for more recent reviews see Aiello, 1987; Hayduk, 1983, 1994). Personal space, the area individuals maintain around themselves into which others cannot intrude without arousing discomfort, has emerged as a central organizing concept of spatial behavior. Particularly, personal space is thought to be a vital factor in the regulation of an individual’s transactions with others in interpersonal as well as in cultural contexts (e.g. Aiello, Nicosia, & Thompson, 1979; Albert & Dabbs, 1970; Frankel & Barrett, 1971; Pedersen & Shears, 1974; Sinha & Mukherjee, 1996).

In that vein, Horner (1983) suggested that personal space must also be an integral component of an individual’s representation of the self, and the self in relation to others. In reviewing the developmental course of infant–stranger reactivity and infant–caregiver attachment as a function of the infant’s emerging capabilities to control and regulate spatial proximity, Horner concludes that the various patterns of stranger reactivity observed in infancy, belong to the same continuum of interpersonal responding assessed by measures of personal space regulation later in life. Despite the
apparent influence of ethological and systems theory concepts on the formulations of both attachment theory and personal space research, they were typically studied as unrelated phenomena. Therefore, a major goal of the present study was to examine whether these two behavioral systems are related. The study was motivated by an assumption that, similar to the development of attachment relationships and probably in relation to it, the regulation of personal space evolves and matures early in life through interactions with primary caregivers.

Attachment is conceived as a behavioral system shaped by evolution to achieve ‘set-goals’ that define the extent to which infants and young children seek proximity to their caregivers. Along these lines, physical proximity to the caregiver is thought to be of primary importance to the infant’s well-being (Bowlby, 1984). The infant’s confidence in the accessibility and responsiveness of its attachment figures is considered an important modifier to the setting of its proximity set-goals. Enduring proximity set-goals are thought to develop on the basis of regular and ongoing infant–caregiver interactions. Such interactions are likely to provide the infant with a sense of security and comfort. Repetitive and salient interactive patterns may then become internally organized to form representations or ‘internal working models’ of the attachment figures as well as of the self (Bowlby, 1973). Thus, it is proposed that infants’ experience with attachment figures may become generalized to determine their internal representations with regard to interpersonal relationships, and in turn to affect the actual distance from the caregiver that individual infants tolerate or prefer (Ainsworth, Blehar, Waters, & Wall, 1978). Later in life, these internal representations may also influence patterns of personal space regulation in interpersonal contexts.

Parallel to the development of attachment representations and possibly in relation to it, the regulation of personal space evolves and matures early in life through interactions with principal figures in the infant’s immediate environment. Developmental research in the field of personal space has usually focused on the size of personal space as a function of age, gender, cultural parameters, and social contexts. The most consistent finding from these studies is that from 5 years of age, there is a gradual increase in the space used for interpersonal interaction (e.g. Dean, Willis, & LaRocco, 1976; Folarin, 1989; Fry & Willis, 1971; Gifford & Price, 1979; Guardo, 1969; Lerner, Iwawaki, & Chihara, 1976; Lomraz, Shapira, Choresm, & Gilat, 1975; Okano, 1985; Pegan & Aiello, 1982; Price & Dabbs, 1974; Sarafino & Helmhut, 1981; Willis, Carlson, & Reeves, 1979). At about 12 years of age, the characteristics of children’s personal space become similar to those of adults (Aiello, 1987).

Research conducted with young adults has shown that personal space regulation, along with other non-verbal behaviors such as touch, eye contact and smile, plays an important role in the processes associated with interpersonal intimacy. The results from a large number of studies indicate that people typically seek an ‘optimal’ distance for interaction. Deviations from this optimal distance result in discomfort and dissatisfaction. For example, college freshmen who were placed in close proximity to an experimenter spent significantly less time in self-disclosure to intimate questions than students who were placed further away (Johnson & Dabbs, 1976). Coutts and Ledden (1977) found that when a female interviewer moved closer, undergraduate females looked at her less and smiled less, whereas when she moved further away they leaned forward, smiled and looked at her more. Finally, Patterson (1977) reported that closer approaches by an experimenter both in the laboratory and in the field produced reduction in eye contact and less confronting body orientations. Such findings are concordant with Argyle and Dean’s (1965) equilibrium theory, which argues that people
tend to seek a comfortable level of intimacy with others and then attempt to maintain it. Thus, a change in one or more intimacy components is expected to produce compensatory reactions in an effort to restore equilibrium. Accordingly, non-verbal behaviors, such as regulation of interpersonal distance, eye contact, smiling and touch, serve to establish and maintain the equilibrium of intimacy in social interactions between people (Argyle & Dean, 1965).

The need for intimacy intensifies during early adolescence (Buhrmester, 1990). Consequently adolescents must possess a more sophisticated arsenal of interpersonal competencies in order to achieve comfortable intimacy with friends. They have to be able to initiate conversation and relationships, appropriately disclose personal information, and skillfully reciprocate peer approaches as well as express their opinions and manage conflicts effectively (Buhrmester, Furman, Wittenberg, & Reis, 1988). They also have to be skillful in the provision of emotional support to friends (Youniss & Smollar, 1985). If not satisfied through friendships, the need for intimacy could leave an adolescent feeling more anxious, alienated, depressed, and less worthy (Sullivan, 1953). Moreover, young people that do not have intimate friendships could be deprived of important validating exchanges, social support and opportunities for self-exploration (Parker & Gottman, 1989).

Based on the role attributed to regulation of non-verbal behavior in interpersonal intimacy, it is reasonable to assume that the various social skills required for interpersonal intimacy and friendship are interwoven with adolescents’ ability to efficiently regulate non-verbal behaviors such as interpersonal distance. We therefore hypothesized that individual differences in personal space regulation would be associated with individuals’ interpersonal competencies. Such links are important to explore because difficulty in forming intimate friendships may become a significant source of stress to young adolescents (Buhrmester, 1990; Buhrmester & Furman, 1987; Sullivan, 1953).

Interestingly personal space measures have rarely been employed in the study of individual differences. In contrast, the attachment literature has described processes that are associated with spatial regulation of infants with different attachment classifications. For example, Cassidy and Berlin (1994) observed that infants and children classified as insecure-ambivalent employ an adaptive strategy of maintaining close proximity to their attachment figure. They suggested that this behavioral strategy might reflect infants’ preoccupation and uncertainty regarding the availability and responsiveness of their attachment figures. The maintenance of close proximity to the attachment figure by insecure-ambivalent infants is seen as an attempt to ensure the caregiver’s responsiveness and availability, whereas securely attached infants are thought to have learned to trust the reliable availability of their caregivers. Consequently, secure infants do not need to constantly maintain proximity to their attachment figure, and they develop to be more autonomous. Finally, in discussing possible consequences of avoidant attachment, Main (1990) suggested that physical or emotional rejection on the part of the attachment figure might lead to avoidance and distance-maintaining strategies in the infant. These distance-maintaining behaviors are adaptive as they function to sustain the attachment relationship.

It is our conjecture that the strategies infants use to regulate proximity to their attachment figures may become internally represented in their working models of interpersonal relationships. These internal representations may then be reflected in the behavioral regulation of personal space and in the definition of its boundaries as well as in interpersonal competencies that are necessary for intimate relationships. Secure
or insecure attachment in infancy may therefore lead to different strategies for personal space regulation later in life and to different ratings of interpersonal competence. Furthermore, interpersonal competence is expected to be concurrently associated with personal space regulation in early adolescence.

The present study evaluated the regulation of personal space of 11-year old children whose attachment to their mothers, fathers and professional caregivers was assessed in infancy (see Sagi et al., 1985). We hypothesized that individual differences in patterns of personal space regulation in early adolescence would be consistently associated with individual differences in the quality of attachment assessed during infancy. More specifically, it was expected that children classified as insecure-ambivalent in infancy would display smaller personal space boundaries as compared with children who were securely attached in infancy. Furthermore, specific hypotheses could be made concerning the extent to which children who were securely or insecurely attached as infants would allow intrusions into their personal space. One hypothesis might be, that given their increased susceptibility to distress as infants, children who were insecure-ambivalently attached would display stronger distress reactions to personal space violations as compared with children who were securely attached. Such behavioral pattern should result in decreased tolerance to personal space violations (i.e. smaller personal space permeability) in children who were ambivalently attached when compared with children who were securely attached. Alternatively, a prediction more closely aligned with attachment theory would suggest that children who were ambivalently attached in infancy would allow larger intrusions into their personal space as compared with children who were classified as securely attached during infancy. From this later perspective, the one we adopted as our research hypothesis, the conflicted, preoccupied, ambivalently attached infant is expected to develop an internal working model promoting close and anxious physical contact, clingingness and relationships with less clearly defined boundaries between self and other. Personal space boundaries may then become more permeable for insecurely attached individuals as compared with individuals who are securely attached. Furthermore, the ambivalence associated with the desire for close contact on the one hand and anger and fear of abandonment on the other might delay the response to personal space intrusions of the ambivalently attached child, resulting in increased personal space permeability.

It may also be expected that adolescents who were classified as insecure-avoidant during infancy would present larger personal space boundaries and allow less intrusion into their personal space as compared with the other two groups. However, the hypothesis concerning the insecure avoidant group could not be tested in the present study due to the documented low incidence of this attachment category in the Israeli culture (van IJzendoorn & Sagi, 1999).

In addition to the dyadic attachment measures, an attachment network variable was introduced into the predictive model taking into account a more comprehensive observation of children’s ecology of attachment relationships. The attachment network concept was of particular interest in the present study given the fact that the participants grew up in an environment in which it was ideologically believed that multiple caregiving is beneficial for children (Aviezer, van IJzendoorn, Sagi, & Schuengel, 1994). Furthermore, van IJzendoorn, Sagi and Lambermon (1992) have shown that an attachment model based on a network of multiple relationships was a more powerful predictor of socio-emotional development five years later compared with attachment to one figure alone. These findings were particularly strong for children living in Israeli kibbutzim.
In summary, four hypotheses were tested in this study. (1) Young adolescents who were insecure-ambivalently attached during infancy were expected to display smaller and more permeable personal space boundaries during early adolescence as compared with children who were securely attached. (2) Young adolescents who had an attachment network comprised of more insecure-ambivalent relationships were expected to show more permeable and smaller personal space boundaries as compared with adolescents whose attachment network was more secure. (3) Young adolescents’ self-reported interpersonal competence, as well as their interpersonal competence as reported by their parents, was expected to be concurrently associated with their personal space regulation. (4) Young adolescents’ attachment status during infancy was expected to be longitudinally associated to their self-reported as well as their parents’ reports of their interpersonal competencies during early adolescence.

METHOD

Participants

There were 64 Israeli children (31 boys, 33 girls) who participated in the study. Their mean age was 11 years and 10 months (range 11:4–12:6). This group constitutes approximately 75% of the original sample of 85 infants who participated in an attachment study in Israeli kibbutzim (Sagi et al., 1985). Of the original sample, ten families resided out of the country or left no forwarding address, eight families (four of which no longer lived on kibbutzim) refused to participate in the study, and one family was not contacted due to prior knowledge regarding the child’s serious illness. Three additional participants were omitted from the analyses due to incomplete personal space data. Out of the 64 children included in the study, 7 children (6 boys, 1 girl) no longer lived on a kibbutz, and 3 others lived on a different kibbutz from the one in which they were raised during infancy. The parents of 11 children (6 boys, 5 girls) were divorced.

Procedure and measures

Three sets of measures were used in the study: Measures of attachment in infancy, measures of personal space regulation in early adolescence, and measures of interpersonal competence in adolescence.

Attachment measures

At 12 months of age the participants’ quality of attachment to their mothers, fathers, and professional caregivers was assessed in the Ainsworth and Witting (1969) Strange Situation procedure. Participants were classified into the traditional ABC attachment categories with each of the three attachment figures (a detailed description of data collection and coding procedures is provided in Sagi et al., 1985). Due to technical problems in the original infancy study, 3 participants did not have a Strange Situation attachment classification with their mother, 1 participant did not have an attachment classification with his father, and 2 participants did not have an attachment classification with their professional caregiver. Frequencies of infancy attachment classifications with mothers, fathers and professional caregivers are presented in Table 1. The distributions of attachment classifications (ABC) with mothers, fathers, or professional caregivers in the present sample (n = 61 for mothers,
Table 1 Frequencies of infancy attachment classifications with mothers, fathers, and professional caregivers

<table>
<thead>
<tr>
<th>Attachment Status</th>
<th>Mother</th>
<th>Father</th>
<th>Professional Caregiver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidant</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Secure</td>
<td>34</td>
<td>40</td>
<td>31</td>
</tr>
<tr>
<td>Ambivalent</td>
<td>23</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>63</td>
<td>62</td>
</tr>
</tbody>
</table>

n = 63 for fathers, and n = 62 for professional caregivers) did not significantly differ from the distributions that were reported in the original sample (Sagi et al., 1985; N = 85). This suggests that participants’ attrition was unrelated to the quality of attachment. Due to the low frequency of the insecure-avoidant classification in the present sample (4 mother–infant pairs, 5 father–infant pairs, and 8 professional caregiver–infant pairs), which is consistent with the typical attachment distribution in Israel, those participants who were classified into this category in infancy were omitted from subsequent analyses. Consequently, the study focused on differences in personal space regulation between an insecure-ambivalent group and a secure group of children.

Personal space measures Participants’ personal space was assessed using the stop-distance procedure (Hayduk, 1981a, 1981b, 1983). Although this procedure is not conducted in naturalistic settings, it is one of the most frequently used measures of personal space regulation, and was shown to produce reliable estimates of preferred interpersonal distance under varied conditions (for the most comprehensive reviews see Aiello, 1987; and Hayduk, 1983). The major advantage of this procedure over other existing measures of personal space such as projective techniques or unobtrusive observation of natural spacing, is that it allows for standard testing conditions and repeated measures, thereby minimizing the influence of the social partner (i.e. experimenter) on the estimated measurement. In order to increase measurement reliability and to obtain a better representation of the social environment, the participant’s personal space was assessed twice: once with a male and once with a female experimenter (counterbalanced).

Testing began with a participant positioned with his/her toes against a drawn line, and the experimenter standing, facing the participant from a fixed distance of 3 meters. From this position the experimenter approached the participant slowly until he/she reported feeling ‘slightly uncomfortable’ by saying ‘Stop’. The experimenter noted the distance between his/her toes and the participant’s toes and committed it to memory (PS1, in centimeters, read from a tape measure that lined the approach route). Then, the experimenter resumed his/her approach until the participant indicated ‘considerable discomfort’. This distance (PS2) was noted and, immediately afterwards, both stop-distances were recorded. During testing, only one experimenter and one participant were in the testing room at any given time. In order to minimize situational variations, the experimenters maintained silence, kept a neutral facial expression and constantly gazed at the subject’s knees to avoid eye contact. Short steps provided a constant approach velocity and insured accurate measurement (Hayduk, 1981b). The entire session was videotaped to allow for checks of standardization across experimenters and sessions.
Four raw measures of the distances recorded during testing, PS1 and PS2 with male and female experimenters, were derived from the stop-distance procedure. Intercorrelations between the male and female experimenter’s PS1 or PS2 scores were high (\(r = .91\) and \(r = .73\), \(ps < .0001\) respectively). Therefore average scores were computed using the male and female experimenter scores for PS1 and PS2. Furthermore, the averaged PS1 and PS2 scores were highly correlated (\(r = .92\), \(p < .0001\)), suggesting that the two measures were internally coherent as measures of personal space. Therefore, PS1 and PS2 scores were averaged to create a single index of interpersonal distance preference (PS).

The reports of discomfort as the experimenter approaches from a distance specify the boundaries of personal space. The rate at which discomfort rises as the approacher moves closer specifies the permeability of personal space. Although individuals with different personal spaces may allow similar absolute intrusions (e.g., 50 cm), such intrusions may imply very different things if a 60-cm or 160-cm personal space boundary is being considered (Hayduk, 1983). Therefore, an additional index of personal space regulation, ‘permeability’, was calculated in order to gain a better understanding of the ways in which participants react to intrusions into their personal space boundaries. This index was computed as the relative proportion of PS1 to PS2 (i.e. \(100 - (PS2 \times 100/PS1)\); Hayduk, 1981a). Accordingly, a low permeability score (i.e. a small difference between PS1 and PS2) indicates a steep rise in the participant’s discomfort as the experimenter crosses the PS1 border and a corresponding low tolerance for intrusion. Conversely, a high permeability score indicates a slow increase in the participant’s distress from PS1 to PS2 and, therefore, a high tolerance for intrusion. PS1 and PS2 scores were inversely correlated with the permeability score (\(r = -.54\) and \(r = -.77\) respectively, \(p < .0001\)), suggesting that, overall, individuals who used larger personal space were willing to tolerate less intrusion into it.

The Adolescent Interpersonal Competence Questionnaire (AICQ) This 40-item measure (Buhrmester, 1990) is a modification of the Interpersonal Competence Questionnaire that was originally developed to assess college students’ relationships competence (Buhrmester et al., 1988). It assesses five domains that are important in close relationships (sample items in parentheses): Self-disclosure (‘how good is this person at opening up and letting others get to know him/herself’), providing emotional support to others (‘how good is this person at making others feel better when they are unhappy or sad’), management of conflicts (‘how good is this person at knowing how to disagree with others without getting into big arguments’), negative assertion (‘how good is this person at telling friends that they have been neglectful or inconsiderate’), and initiation of relationships (‘how good is this person at phoning others to set up a time to do things together’). Children, their mothers and their fathers completed the AICQ by rating their responses on 5-point rating scales to indicate the participating children’s competence in handling each type of situation ranging from poor to extremely good. Although the AICQ assesses five domains of interpersonal competence, moderate to high significant intercorrelations were found between the different factors of the AICQ, ranging from .22 to .54 for children’s self-reports, from .37 to .69 for maternal reports, and from .41 to .69 for paternal reports. Therefore, following Buhrmester (1990), a total interpersonal competence score was computed by averaging out all AICQ items for each respondent. Cronbach’s \(\alpha\) coefficients were computed separately for children’s self-reports, mothers’ and fathers’ reports (\(\alpha\) coefficients were: .86, .94 and .93 respectively).
RESULTS

Preliminary analyses
To examine whether participants’ gender was associated with either attachment security during infancy or personal space measures in early adolescence, a series of comparisons were computed. Three independent chi-square analyses were carried out for testing the association between infants’ gender and attachment classification with mothers, fathers and professional caregivers respectively. None of these analyses yielded statistically significant results. Next, a series of *t*-tests was computed to assess possible gender differences in personal space regulation (PS and permeability measures). No significant gender differences were found. Based on these findings gender was not included in further analyses.

Attachment to mother, father, or professional caregiver and personal space regulation
Means and standard deviations of personal space measures (PS and permeability) by attachment classification in infancy with mother, father and a professional caregiver are presented in Table 2. Planned contrasts were computed using infant attachment classification as the independent variable and the personal space measures as dependent variables. Children classified as insecure-ambivalent with their mothers and children classified as insecure-ambivalent with their professional caregivers in infancy displayed significantly larger permeability scores as compared with children classified as securely attached in infancy (*t*(55) = 1.78, *p* < .05 and *t*(52) = 2.63, *p* < .005, respectively). The remainder of the comparisons – that is, PS for mother or professional caregiver, and all personal space measures with attachment classifications to father – did not result in significant findings.

Attachment network and personal space regulation
To supplement the observations concerning particular attachment dyads and capture a broader estimation of the way in which children’s ecology of attachment relationships is associated to personal space regulation, an ‘attachment network’ profile was constructed, taking into account the participants’ relationships with their mothers and professional caregivers. Fathers were omitted from this attachment network since the above-presented analyses failed to show an association between attachment to father and personal space regulation in early adolescence. Four groups were composed: (1) Children who had insecure-ambivalent attachments with both the mother and the professional caregiver (I-I); (2) children who were secure with the mother and ambivalent with the professional

Table 2 Descriptive statistics of personal space measures by attachment classification in infancy with mother, father and a professional caregiver

<table>
<thead>
<tr>
<th></th>
<th>Mother</th>
<th></th>
<th>Father</th>
<th></th>
<th>Professional caregiver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B (n = 34)</td>
<td>C (n = 23)</td>
<td>B (n = 40)</td>
<td>C (n = 18)</td>
<td>B (n = 31)</td>
</tr>
<tr>
<td>PS</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>78.82</td>
<td>40.84</td>
<td>71.09</td>
<td>44.37</td>
<td>77.21</td>
</tr>
<tr>
<td>Permeability</td>
<td>48.91&lt;sup&gt;a&lt;/sup&gt;</td>
<td>14.05</td>
<td>55.48&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.35</td>
<td>51.53</td>
</tr>
</tbody>
</table>

*Key:* B = secure attachment; C = insecure-ambivalent attachment
*<sup>a</sup> and <sup>b</sup> These different lower-case letters indicate significant differences in personal space permeability between securely attached and ambivalently attached children.
 caregivers (S-I); (3) children who were ambivalent with the mother and secure with the professional caregiver (I-S); and (4) children who were secure with both the mother and the professional caregiver (S-S).

Means and standard deviations for PS and permeability by attachment network classification in infancy are presented in Table 3. Two ANOVAs were conducted, one using the PS measure and one using the permeability score as the dependent variables. The ANOVA for the permeability score revealed a significant difference between the attachment network security levels ($F(3, 44) = 3.04, p < .05$). Post-hoc Scheffé comparisons indicated that children who had two insecure attachments in infancy (i.e. an insecure attachment with the mother and the professional caregiver; I-I) displayed greater personal space permeability as compared with children who had two secure attachments in infancy with both the mother and the professional caregiver (S-S). Non-significant post-hoc differences were found between children in the S-S group and either S-I or I-S groups, between children in the I-I and S-I or I-S group, and between children in the S-I and I-S groups. The ANOVA using the PS measure as a dependent variable yielded non-significant between-groups differences.

**Perceived interpersonal competence and personal space regulation** Pearson product moment correlations were computed between the personal space measures (PS and permeability) and the total AICQ scores reported by each of the parents and by the child in order to explore concurrent associations between perceived levels of interpersonal competence within friendships and personal space regulation at early adolescence. A significant negative association was found between perceived interpersonal competence as reported by mothers and by fathers and children’s PS measure ($r = -.22$ and $r = -.24$ respectively $p < .05$). These findings may suggest that parents perceive a child having smaller personal space boundaries as a sign of increased interpersonal competence. A significant positive association was found between mothers’ reported perception of their children’s interpersonal competence and children’s personal space permeability ($r = .28, p < .05$). This finding could suggest that mothers perceive a larger permeability of personal space as being associated with increased interpersonal competence. Non-significant associations were found between fathers’ AICQ reports and permeability, and between children’s self-reported AICQ and any of the personal space measures.

**Attachment in infancy and perceived interpersonal competence in early adolescence** To assess whether attachment classifications in infancy predicted perceived interpersonal

<table>
<thead>
<tr>
<th>Table 3 Differences between personal space scores according to attachment network in infancy</th>
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<tbody>
<tr>
<td><strong>Attachment network (mother, professional caregiver)</strong></td>
</tr>
<tr>
<td>I-I (n = 10)</td>
</tr>
<tr>
<td>PS</td>
</tr>
<tr>
<td>Permeability</td>
</tr>
<tr>
<td>61.57</td>
</tr>
<tr>
<td>61.91</td>
</tr>
</tbody>
</table>

Key: I-I = insecure-ambivalent attachment with both the mother and the professional caregiver; S-I = secure attachment with the mother, ambivalent attachment with the professional caregiver; I-S = ambivalent attachment with the mother, secure attachment with the professional caregiver; and S-S = secure attachment with both the mother and the professional caregiver.

a and b These different lowercase letters indicate significant differences in personal space permeability between children with I-I and S-S attachment networks.
competence in early adolescence, t-tests between the secure and ambivalent attachment groups for mother, father and professional caregiver were calculated using the AICQ scores reported by the parents and the child as dependent measures. Mothers of children who were ambivalently attached to them in infancy perceived their adolescent child to possess greater interpersonal competence \((M = 3.51, SD = .69)\) as compared to the AICQ scores reports by mothers of children who were securely attached to them in infancy \((M = 3.15, SD = .51; t(54) = 2.27, p < .05)\). Attachment classifications with fathers or professional caregivers did not predict perceived interpersonal competence in early adolescence.

**DISCUSSION**

Although various studies found that security of attachment in infancy is an important predictor of children’s later socio-emotional adjustment, outcomes have seldom been assessed beyond middle childhood, nor has attachment been related to personal space regulation. The present study was designed to fill in this gap, by examining the associations between 11-year-olds’ regulation of personal space and the quality of attachment to their primary caregivers during infancy. Overall, the results suggest that individual differences in children’s personal space behavior were significantly related to infancy attachment security/insecurity with the mother and with a professional caregiver.

Interestingly, infant–father attachment did not predict any of the personal space behaviors at adolescence. This finding may suggest a relatively limited role for fathers in the consolidation of spatial behavior in children. Alternatively, it may reflect the lesser amount of physical interaction that kibbutz fathers may have had with their infants compared with the amount of time infants spent physically interacting with their professional caregivers or their mothers. It is important to note that the participants in the present study grew up in communal sleep arrangements and by virtue of their daily routine spent the largest amount of time interacting with their professional caregivers. In addition, mothers in kibbutzim were typically more involved in child-rearing and spent more time with their infants than did fathers (Aviezer et al., 1994).

The nature of the attachment to the mother or the professional caregiver did not predict the actual size of personal space boundaries (PS). Instead, the quality of infancy attachment to mothers and to professional caregivers each predicted children’s tolerance for intrusion into their personal space ten years later. Children who were ambivalently attached to their mothers or to their professional caregivers in infancy allowed more intrusion into their personal space than did children who were classified as securely attached to mothers or professional caregivers in infancy. This pattern of spatial behavior was punctuated by the findings pertaining to the attachment network model including mother and professional caregiver. The results from these analyses indicated that children who had two insecure-ambivalent attachments in infancy demonstrated larger permeability of personal space as compared with children who had a network comprised of two secure attachments. In the present study, there were no significant differences in personal space regulation between children who had secure attachment with mother and insecure-ambivalent attachment with the professional caregiver or vice versa. These findings may allude to the complexity involved in the formation of internal working models based on relationships with multiple attachment figures. The failure to discern significant differences between the two
mixed groups of secure and insecure attachment with mother or professional caregiver may also be due to lack of sufficient power in the study’s design. That being said, the findings also highlight the potential that is embodied in the assessment of the developmental outcomes of attachment based on a broader ecological network.

Taken together, the findings suggest that a part of the variability underlying individual differences in personal space regulation in early adolescence could be consistently attributed to internal representations of attachment formed during infancy. Caregivers’ accessibility, availability and sensitivity are related to attachment security in infancy (for a meta-analysis, see De Wolff & van IJzendoorn, 1997). Such interactive characteristics of caregivers may foster attachment security as well as personal space regulations and thus could play an important role in the interlocking between attachment and personal space behaviors. In other words, it is plausible that not only is the quality of infant–caregiver attachment determined by the nature of the caregiver’s sensitivity, but also the adaptive regulation of personal space is an outcome of the caregiver’s sensitivity in the dyad. Infants repeatedly experience a physical distance from their attachment figures and adjust to it as a means of ensuring their physical and emotional security. This ongoing experience may also have bearings on the child’s schemata of the appropriate and desirable spacing between people.

Thus, it may be the case that children who are securely attached to their caregivers during infancy possess a clearer representation of interpersonal relationships and of the desirable distancing between individuals. These representations are acquired through consistent contact with a caregiver who is sensitive to the infant’s needs, and it is this experience that may also support expectations concerning the desired proximity to the caregiver. Securely attached individuals are likely to be well aware of their personal boundaries and will therefore maintain their personal space limits and achieve efficient equilibrium of their interpersonal distance. If this is the case, then securely attached individuals’ social interactions are likely to become comfortable experiences, which may reinforce their secure representations of self, of others, and of relationships.

In contrast, ambivalently attached infants are seen as experiencing inconsistent responsiveness and insensitivity on the part of their attachment figures. Their bids for attention and general clinginginess may represent intensified attachment behavior in an attempt to maintain proximity to the attachment figure, hence they become emotionally confused and preoccupied with attachment needs, at the expense of developing autonomy (e.g. Cassidy & Berlin, 1994; Main & Goldwyn, 1998). Such confusion and preoccupation may extend themselves to the regulation of personal space in the form of ambiguous boundaries. The lack of clarity is expressed in hesitation, indecisiveness, fear of abandonment, and an excessive need to feel emotionally close to others, all of which may lead children to display excessive proximity-seeking at the expense of allowing themselves lesser personal space. Moreover, the mixed feelings that ambivalently attached individuals harbor towards physical and emotional proximity may set the stage for confusing non-verbal signals and misunderstandings between these individuals and their social partners. Such misunderstandings could reinforce the ambivalently attached individuals’ preoccupation and expectations for non-reciprocity, thus creating a vicious cycle of insecurity.

Considering the role of non-verbal behaviors in establishing intimacy in interpersonal exchanges, the above-discussed findings highlight a novel aspect of peer competence. It was recently concluded, based on a meta-analysis, that the influence of attachment security on children’s peer relations is only modest, but more pronounced in close friendship because of the resemblance between the bonds of family life and the
intimacy of friendship relations (Schneider, Atkinson, & Tardif, 2001). Schneider et al. (2001) also argued that certain behavioral propensities, such as aggression and social withdrawal, which have been found to alienate peers, might also affect close relations because they function as regulators of access to close friendships. Similarly, appropriate regulation of personal space, which is a functional element in social interchanges with peers, may also play a role in the regulation of children’s accessibility to close friendship.

Finding associations between infancy attachment, regulation of personal space and maternal perception of their adolescent children’s interpersonal competence are concordant with another finding of Schneider et al. (2001) who reported larger-effect sizes linking attachment and interpersonal competence based on parental perceptions, in particularly mothers. In the present study, as might be expected, parents perceived children who used larger personal space and allowed less intrusion into it as possessing lower interpersonal competence with friends. It may be the case that physical proximity to others serves as a broad and salient criterion of increased interpersonal competence in friendships. The roots of such interpersonal proximity and feelings of intimacy in friendships among peers could be intuitively traced back to earlier experiences with primary attachment figures.

However, in taking into account the excessive need for intimacy and loss of self boundaries associated with ambivalent attachment, it is not surprising that mothers of children who were ambivalently attached to them in infancy reported them as high on the interpersonal competence questionnaire in adolescence. The response pattern of individuals involved in an ambivalent relationship to questionnaire items such as ‘He feels free to talk with other children about almost everything’, ‘I know how he feels about things without his telling me’, or ‘If he wants something I let him have it even if I want it too’, is expected to reflect their anxious-ambivalent perception of intimate relationships. Simply put, the finding that children who were ambivalently attached in infancy show greater personal space permeability goes hand in hand with the maternal perceptions of these children as displaying behaviors that are associated with increased interpersonal contact.

However, based on the present data, these associations do not seem to follow a linear predictive pattern in which one element could be directly mapped onto the parameters of the other. In this study we made an attempt to connect the taxonomies of two research fields: attachment theory and personal space research. Interpersonal competence and its supportive role to the formation of intimacy in adolescence seem to function as a relevant link between such connections. While we were able to show significant longitudinal and concurrent associations between each of the elements in this conceptual triangle, more research is needed in order to clarify how exactly attachment in infancy is affecting interpersonal competence in adolescence and personal space regulation as one of its non-verbal manifestations. Furthermore, as has been suggested elsewhere (e.g. Thompson, 1999), it is plausible that the longitudinal associations between infancy attachment and personal space behavior in adolescence are mediated by the concurrent relations of adolescents to their parents. Clearly, future research into the mechanisms by which early attachment relationships affect later interpersonal competence would have to consider such mediating influences. Such concurrent associations may have contributed to the continuity between infancy attachment to mothers and personal space regulation in early adolescence. However, in the context of the present study it is important to note that the professional care-givers who were responsible for infant care were not involved in these children’s care.
after infancy. Therefore, the reported continuity between attachment to professional caregivers in infancy and personal space regulation in adolescence could not be the function of such an association.

Of particular interest is the finding of significant differences in personal space regulation between children who had two secure attachments, one with their mother and one with their professional caregiver, vs. those children who had insecure-ambivalent attachments with each of these attachment figures. One concern associated with this finding has to do with the possibility that an attachment network entirely characterized by insecure relationships may reflect a temperamental trait in the child. If this is the case, such temperamental tendencies may also be related to differences in personal space regulation. For example, Fox and Calkins (1993) reported that infants who exhibited high behavioral inhibition to novel events were more likely to be classified as ambivalently attached in the Strange Situation. Accordingly, it seems reasonable to speculate that temperamentally wary children should have stopped the unfamiliar experimenters sooner than did securely attached children. In other words, the ambivalent group, compared with the secure group, should have had larger personal space boundaries and smaller permeability of personal space. However, the findings in the present study are in the opposite direction. Children who were ambivalently attached as infants displayed smaller personal space boundaries and larger permeability than did those who were securely attached as infants. Therefore, it seems that the temperament hypothesis does not gain support from the present data. Simultaneous assessment of temperament and quality of attachment in infancy is essential to better elucidate this issue.

Finally, the high prevalence of ambivalently attached infants compared to the very low frequency of avoidantly attached infants in Israel has been well documented in a spectrum of studies (for reviews see Sagi, 1999; van IJzendoorn & Sagi, 1999). The distribution of attachment classification in Israel is different from that reported in most studies conducted in Western cultures. Western studies typically report a higher incidence of avoidant attachments and a very low incidence of ambivalent attachments within the insecure group. Thus the current study has provided a unique opportunity to better examine individual differences between securely attached and ambivalently attached infants. With regard to avoidant relationships, it has been proposed that the underlying process accounting for this quality of attachment is the infants’ experience of their caregivers as being consistently inaccessible and rejecting (Ainsworth et al., 1978; Isabella, 1993). Based on our previous conceptualization, it is likely that such experience would generalize to the domain of personal space regulation, so that avoidant children will be prone to a larger interpersonal distance and to less tolerance of intrusions into their personal space boundaries, compared with either securely attached or ambivalently attached children. The low frequency of avoidantly attached infants prototypical to all Israeli samples (including the present study) restricted our ability to test a full model of associations between quality of attachment and personal space regulation. However, the long-term predictions of personal space regulation from attachment in infancy, as well as the concurrent associations between personal space measures and perceived interpersonal competence, demonstrate the potential relevance of the personal space concept to the study of individual differences in social development. It remains for future research to assess in other cultures the predicted association between avoidant attachment and personal space regulation.

In conclusion, the present study provides unique findings of long temporal prediction from infancy to early adolescence. Personal space regulation is a promising
construct for studying longitudinal transitions from attachment during infancy to other relationships in later development.

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