

Contents lists available at [ScienceDirect](#)

# Child Abuse & Neglect



Research article

## Attachment in institutionalized children: A review and meta-analysis


 Francesca Lionetti<sup>a,\*</sup>, Massimiliano Pastore<sup>b</sup>, Lavinia Barone<sup>a</sup>
<sup>a</sup> Department of Brain and Behavioral Sciences, University of Pavia, Italy

<sup>b</sup> Department of Developmental and Social Psychology, University of Padova, Italy

### ARTICLE INFO

#### Article history:

Received 29 November 2014

Received in revised form 14 February 2015

Accepted 16 February 2015

Available online 5 March 2015

#### Keywords:

Attachment

Institution

Meta-analysis

Bayesian approach

### ABSTRACT

In this article we review the literature on attachment patterns in institutionalized children and then perform a meta-analysis on data from 10 attachment studies involving 399 children in institutional settings. We computed the overall attachment distribution of secure, insecure, and disorganized rates and explored the effect of a set of moderating variables (i.e., country of institutionalization, attachment assessment procedure, age at entry, and age at assessment). To overcome bias related to the small number of studies, we conducted both classical and Bayesian meta-analysis and obtained comparable results. Distribution of children's attachment patterns was: 18% secure, 28% insecure, and 54% disorganized/cannot classify. Compared to their family-reared peers, children living in an institution were found to be at greater risk for insecure and disorganized attachment, with a similar medium effect size for both distributions ( $d = 0.77$  and  $d = 0.76$ , respectively). The following moderating variables were associated with insecure attachment: representational assessment procedures ( $d = 0.63$ ) and Eastern European countries of origin ( $d = 1.13$ ). Moderators for disorganized attachment were: Eastern European countries of origin ( $d = 1.12$ ), age at institution entry before the first birthday ( $d = 0.93$ ), and age at assessment under three years of age ( $d = 0.91$ ). Implications for child development and policies are discussed.

© 2015 Elsevier Ltd. All rights reserved.

### Introduction

Infants and children reared in institutions more frequently present growth impairments and negative cognitive and social–emotional outcomes (Juffer et al., 2011). Some known risk factors are the unfavorable caregiver-to-child ratios, impoverished environments, the frequent turnover of professional caregivers, and lack of training for caregivers on how to promote the development of children experiencing stressful and helplessness feelings (Barone, Dellagiulia, & Lionetti, 2015; Carlson, Hostinar, Mliner, & Gunnar, 2014). Institutionalized children are also at increased risk of sexual abuse compared to the general population and to children in foster care (Euser, Alink, Tharner, van IJzendoorn, & Bakermans-Kranenburg, 2013). Children's residential institutions are found in low, middle, and high income countries from North and Latin America to Europe, Asia, Africa, and the Middle East and North Africa. It is, however, difficult to establish the exact number of institutionalized children because systematic record-keeping is lacking in many countries. Estimates range widely from 2 million reported by the United Nations General Assembly (2010) to 8 million reported by Save the Children (2009).

In 1989, the United Nations Convention on the Rights of the Child first stressed the need to guarantee special protection by providing alternative family placements when life with biological parents is incompatible with a child's safety (Unicef,

\* Corresponding author at: Piazza Botta 11, 27100 Pavia, Italy.  
E-mail address: [francesca.lionetti@unipv.it](mailto:francesca.lionetti@unipv.it) (F. Lionetti).

1989). In a randomized study (Nelson et al., 2007), it was subsequently confirmed that placement in alternative family settings such as foster care is better for adequate child development than placement in orphanages and institutional settings. Recently, a team of renowned experts on child development, in conjunction with the American Orthopsychiatry Association, published a consensus statement on group care contexts affirming the right of children to grow up in a family setting (Dozier et al., 2014). However, even though most countries recognize that being placed in an institution is not the best practice for the child's wellbeing, institutionalization continues to be an option (Engle et al., 2011; Soares et al., 2014), and child neglect in general remains a global phenomenon of considerable extent (Stoltenborgh, Bakermans-Kranenburg, & van IJzendoorn, 2013; Stoltenborgh, Bakermans-Kranenburg, Alink, & van IJzendoorn, 2015). According to the Society for Research in Child Development, studies that address the effects of institutionalization are needed to change policies and promote the achievement of alternative care conditions (Engle et al., 2011; Groza, Bunkers, & Gamer, 2011) which will enable the fulfillment of the rights of children to be protected from neglectful contexts and reared in adequate environments (see Stoltenborgh et al., 2013).

This article seeks to address this issue by looking at the specific effects of institutionalization on children in two ways. First, we conduct a critical review on the relevance of the attachment framework for investigating the child's emotional adjustment in institutions, with a specific focus on attachment patterns. Second, we carry out a meta-analysis of attachment patterns in institutions, investigating the insecure and disorganized distributions and role of a set of variables in moderating attachment. We apply both the classical and Bayesian meta-analytic approaches.

### *Relevance of the Attachment Framework to Institutional Settings*

The absence of a stable, primary, and caregiving figure, also known as *maternal deprivation* or *structural neglect* (Bowlby, 1951), is the main shared feature of children living in an institution. Although life in institutions is not incompatible with the formation of an attachment bond (Carlson et al., 2014), attachment is significantly compromised by the frequent turnover of professional caregivers, who often lack training on how to sustain children's development in challenging conditions (Barone et al., 2015). Attachment theory (Bowlby, 1969) provides a relevant framework within which to analyze developmental outcomes related to institutionalization because it emphasizes the important role of the early dyadic parent–child relationship for children's wellbeing. It has also given rise to the development of well tested procedures for the assessment of attachment relationships (Cassidy & Shaver, 2008).

Infancy and childhood assessment procedures can be divided into two broad categories: *observational procedures*, which assess attachment at a behavioral level using separation–reunion procedures, and *representational procedures*, which use story stem techniques to evaluate the internal representation of the attachment relationship (Emde, Wolf, & Oppenheim, 2003). Both measures have been used in studies with institutionalized children (see the meta-analytic section), but it is worth mentioning for methodological reasons that both were originally developed for the purpose of assessing the attachment pattern toward a selective caregiving figure, i.e., the biological or adoptive parents who usually take care of the children in the home environment. There has been much debate in recent years over whether traditional attachment assessment methods maintain their validity in institutional situations, where the attachment bond assessed is that toward a favorite professional caregiver (Bakermans-Kranenburg et al., 2011) rather than toward a parent in a home-rearing situation. In this regard, Zeanah and colleagues (2005) obtained interesting results with the 5-point rating scale they developed to document the *typicality* of the range of child behavior within the traditional attachment categories of secure, insecure, and disorganized, for a well-known separation–reunion procedure assessing attachment in infancy (i.e., the Strange Situation Procedure, see Ainsworth, Blehar, Waters, & Wall, 1978). They found that every child reared by his/her biological parent attained the highest typicality score (i.e., 5) within their attachment category, irrespective of what this was (i.e., either secure or insecure), whereas only 3% of children living in institutions did. Similar, though less extreme, results were reported by Dobrova-Krol, Bakermans-Kranenburg, van IJzendoorn, and Juffer (2010). Attachment of institutionalized children to professional caregivers, although possible (Carlson et al., 2014), appears to be more complicated to assess than has been appreciated. Thus, further research is needed on the validity of the traditional assessment methods for the population of institution-reared children.

### *Attachment Patterns and Attachment Disorders*

According to attachment theory, depending on the degree of sensitivity of the caregiver's response to the infant's needs and signals, the infant develops different patterns of attachment (Ainsworth et al., 1978; Grossmann, Bretherton, Waters, & Grossmann, 2013). Secure infants experience constant availability and comfort from caregivers, and this feeling of confidence in the caregiver is simultaneously reflected in a feeling of confidence in his/her own interactions with the world. This process promotes adaptive social–emotional development (Barlow, van der Voort, Juffer, & Bakermans-Kranenburg, 2014; Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012; Groh et al., 2014; Weinfield, Sroufe, Egeland, & Carlson, 2008). Conversely, insecure infants have caregivers who discourage proximity (as for insecure-avoidant infants) or who show inconsistent caregiving behaviors (as for the insecure-ambivalent). As a result, insecure infants suppress the manifestation of negative emotions and attachment signals (insecure-avoidant) or hyper-activate the negative emotions (insecure-ambivalent). These are both non-optimal strategies because they may compromise exploration and require more effort to manage emotions (Weinfield et al., 2008). Nonetheless, insecure strategies represent the most adaptive response that the infant has identified during his/her caregiving history for maintaining proximity with the caregiver and feeling safe;

in sum these are organized strategies if compared to the disorganized ones, these latter being typical of the condition where the child is unable and helpless in using the caregiver for regulating his/her painful emotions.

Thus beyond the insecure strategies are the even more vulnerable disorganized and cannot/classify attachment patterns. Disorganized and cannot/classify attachments may be the result of an abusive or emotionally unresolved parent, or, as recently observed, they can originate from life in residential care contexts (Vorria et al., 2003; Zeanah, Smyke, Koga, & Carlson, 2005). Both patterns, the D and CC, are considered the most risky for the child's emotional and social development, with negative outcomes in terms of emotion regulation and behavioral problems in kindergarten and preschool years (Barone & Lionetti, 2012; Groh et al., 2012). Disorganized caregiving relationships in childhood are also related to an increased risk for dissociation, stressful feelings (Lionetti, Pastore, & Barone, 2015) and disruptive caregiving behavior in adulthood (Barone, Bramante, Lionetti, & Pastore, 2014; Carlson, 1998; Liotti, 2011).

From an attachment perspective, another way of conceptualizing the emotional adjustment of children from pathogenic caregiving contexts is the notion of attachment disorders (O'Connor & Zeanah, 2003; Tizard & Hodges, 1978; Tizard & Rees, 1975), for which institutionalization is one of the theoretical foundations of the interest (O'Connor & Zeanah, 2003; van Ijzendoorn & Bakermans-Kranenburg, 2003). The notion of attachment disorders was operationalized as *Reactive Attachment Disorder* (RAD) in DSM-IV (the Diagnostic and Statistical manual of Mental disorders), and subsequently in the DSM-5, with some differences between the two editions: the fourth specified either indiscriminate friendly behavior toward an adult stranger (disinhibited type) or lack of attachment toward the primary caregiver (inhibited type); whereas in the fifth edition, the two types are classified separately, with indiscriminate friendliness referred to as *Disinhibited Social Engagement Disorder*, and RAD referring exclusively to the child's difficulty in establishing an attachment relationship with a primary caregiver. This has more narrowly focused the notion of attachment disorder as pertaining to a selective bond.

On the association of attachment patterns with attachment disorders only a few studies have been published. Dobrova-Krol and colleagues (2010) and Barone et al. (2015) identified only a trivial association between disorganized attachment and indiscriminate friendliness; Zeanah and colleagues (2005) reported similar data, i.e. no association between the degree of the child's atypical behavior at the Strange Situation and indiscriminate friendliness rates. Nonetheless, both non-secure attachment strategies and indiscriminate friendliness are highly represented in institutions. Despite a few exceptions, as O'Connor and Zeanah noted a few years ago (2003), we can conclude that there are still more theoretical than empirical papers on the construct of attachment disorder; and if attachment has informed research and our knowledge on emotional developmental pathways, the construct of attachment disorders has been mainly used in clinical contexts. More research is thus called for if we want to achieve a definitive conclusion about the association between attachment patterns and attachment disorders in institutionalized children. Still, by now we can be confident that if it is unlikely that all disorganized infants present a reactive attachment disorder. It is more likely that infants presenting an attachment disorder also have a disorganized attachment pattern which will negatively influence their current and subsequent social-emotional adjustment (Bakermans-Kranenburg et al., 2011; O'Connor & Zeanah, 2003).

### *The Role of Moderating Variables*

That institutionalized children are at risk of non-secure attachment relationships and attachment disorders is suggested by the results of several theoretical and empirical articles. The development of an unequivocal conclusion about moderators is, however, lacking. Studies conducted thus far have focused on different candidate moderating variables with mixed results, and only a few variables analyzed in the literature have been reported to increase the risk of insecure and disorganized rates in institutions. Vorria and colleagues (2003) found that attachment in institutions was not predicted by birth weight, premature birth, health status, gender, ethnicity, temperament, cognitive abilities, or professional caregivers' sensitivity. Zeanah et al. (2005) reported no influence for cognitive development, and the only significant variable was the observed quality of the caregiving environment. In the Leiden research group's study (Dobrova-Krol, Bakermans-Kranenburg, van Ijzendoorn, & Juffer, 2010) comparing family and institutionally reared HIV and non-HIV children, institutional care but not the presence of the immunodeficiency virus was reported to be associated with higher levels of attachment insecurity and disorganization. This finding suggested that the structural neglect in childcare institutions may be more damaging for attachment formation than living with HIV in potentially at risk families. Torres, Maia, Verissimo, Fernandes, and Silva (2012) obtained similar results, reporting that being reared in an institution is a risk factor for insecure and disorganized attachment, whereas being reared in a family with a low educational level did not affect attachment. Barone and colleagues (2015) recently published a study assessing attachment representations in one of the oldest groups of institutionally reared children studied so far. Interestingly, attachment distribution was independent of length of institutionalization. Given that all but six children were admitted to an institution after their first birthday, this suggests that when neglect exceeds a specific window of time in development (as in the first years of life for attachment), duration is less relevant.

To include selected moderating variables in a meta-analysis, each moderator should be present in at least three or four papers, and unfortunately, the articles included in this overview did not meet that criterion. Nevertheless, there is a list of a few candidate factors reported in almost all articles that are potential, but as yet unexplored, moderating mechanisms. One of these is the country of origin, a variable that is almost always available. A recent meta-analysis on adopted children reported that Eastern European country of origin was found to be significantly associated with non-secure patterns (van den Dries, Juffer, van Ijzendoorn, & Bakermans-Kranenburg, 2009). The second is the type of procedure used for investigating attachment, i.e., whether it is based on observational assessment of attachment at a behavioral level vs. story stem

techniques assessing attachment at a representational level. We discussed the relevance of reliable assessment procedures for evaluating attachment in institutionalized children, and so far data from studies using story stem techniques for the analysis of attachment representations have not been discussed yet with regard to their validity on institutionalized children. The third is age at institution entry, and the fourth is age at assessment. The latter two are included in view of the debate about the extent to which environmental influences depend on period of life (Sheridan & Nelson, 2009). Specifically, the early experience hypothesis postulates that the first three years of life constitute a period of specific importance because of the profound changes in brain development that occur during this time, potentially increasing permeability to the environment. In this connection, fewer atypical attachment behaviors were reported for children removed from Romanian institutions and placed in foster homes if they had been placed before 24 months (Smyke, Zeanah, Fox, Nelson, & Guthrie, 2010). Similarly, it has been found that the earlier the adoption placement the more likely it was that attachment would be secure (Lionetti, 2014; van den Dries et al., 2009). Still, it has been pointed out that the number of studies evaluating the impact of environmental influences on development early in life within a sensitive period framework is limited in number (O'Connor, Parfitt, & Zeanah, 2009).

## Method

The current study was conducted in accordance with the PRISMA guidelines for systematic reviews and meta-analyses (Moher, Liberati, Tetzlaff, & Altman, 2009) and was inspired by the review of Bakermans-Kranenburg and colleagues (2011) on attachment in institutionalized children. In the meta-analysis, we estimated the overall attachment distribution for the secure, insecure, and disorganized classifications; we computed the effect size for the influence of institutionalization vs. family context on attachment distribution; and we tested whether the selected moderators – country of institutionalization, attachment assessment procedure, age at entry into the institution, and age at assessment – play a role in attachment patterns in currently institutionalized children.

### Statistical Analyses

The statistical software R (R Core Team, 2013) was used and two data analysis frameworks adopted: the classical one, using the *metafor* R package (Viechtbauer, 2010), and the Bayesian approach, using the *rjags* R package (Plummer, 2014). In the classical framework, we evaluated the effect of nonsignificant unpublished findings using the Duval and Tweedie trim and fill method (Duval, 2005; Duval and Tweedie, 2000a,b). The fail-safe number approach (Mullen, 1989) was used to estimate the minimum number of unpublished studies that would be needed to overturn the conclusion reached in the meta-analysis. To analyze whether the overall effect size changes significantly when the combined effect sizes are calculated after the successive removal of one effect size at a time, we used the jackknife method (Tukey, 1958). The Bayesian framework has become more popular in recent years in the developmental psychology field (van de Schoot et al., 2013) and has a long history in meta-analyses conducted in the health care and medical fields (Egger, Smith, & Altman, 2008). In comparison with the classical meta-analytic (i.e., frequentist) approach in which the null hypothesis is tested, it allows previous knowledge to be incorporated into data analyses. Specifically, the components of Bayesian framework analyses can be summarized as: (1) *prior distribution*, i.e., the knowledge derived from previous studies and proposed by the researcher; (2) the *observed evidence*, i.e., information from the current data itself, expressed in terms of the likelihood function; and (3) the *posterior distribution* reflecting the updated knowledge, derived from comparing data (i.e., the likelihood function) with the prior distribution. The posterior distribution is what is usually referred to as the result of the analysis. In the current meta-analysis, we adopted a skeptical prior (Spiegelhalter, 2004; Spiegelhalter, Abrams, & Myles, 2004). We assumed a sceptical prior, which reduces the chances of identifying a spurious effect (Wagenmakers, Wetzels, Borsboom, & Van der Maas, 2011), meaning that the Bayesian approach with a sceptical prior is more conclusive in refuting an association and, conversely, gives more certainty when an effect is detected. Bayesian parameters and Highest Density Interval (HDI; Kruschke, 2013), at a 95% credible interval, were derived from our estimated posterior distribution. The JAGS scripts (Plummer, 2003) for the considered models are reported in the [Appendix](#).

### Literature Search

We searched for relevant literature in the following electronic sources: Psych-INFO, ERIC, Scopus, Web of Science and PUBMED. We used the keywords institution\* or residential\* (the asterisk indicates that the search contained but was not limited to that word) in the article's title, abstract, and keywords in combination with the term "attachment pattern\*" or with "attachment representation\*" in the paper text. This resulted in 174 papers and/or conference proceedings. We carried out a preliminary screening, by examining title and abstract and then main text. Papers were included in our meta-analysis if: (a) the term institution referred to a multiple-caregiver rearing context as opposed to a biological, foster, or adoptive family environment; (b) the authors reported the attachment pattern of institutionalized children using the data distribution categories of secure, insecure, and disorganized or cannot classify; (c) they used either observational assessment procedures of attachment behavior or story stem techniques investigating mental representations; and (d) attachment toward a favorite professional caregiver had been assessed during the stay in an institution. Studies were excluded if: (a) children were involved in an experimental intervention program to promote secure attachment; (b) children were no longer

**Table 1**

Studies included in the meta-analysis are reported below. The first line of each study refers to the institutionalized group; the second line to the control/family-reared group. The asterisk (\*) indicates that the control group's attachment distribution was derived by normative and multi-center studies van Ijzendoorn et al. (1999); Barone et al. (2009), and *n* was set equal to that of the institutionalized group.

Study	Country	Instrument	Age at entry	Age	<i>n</i>	B (%)	A/C (%)	D/CC (%)
Archer (2012)	China	SSP	Before 1st year	12–37	10	10	20	70
				12–37	61	57	30	13
Barone et al. (2015)	Ukraine	MCAST	After 1st year	55–92	39	18	31	51
				54–92	39*	63	26	11
Dobrova-Krol et al. (2010)	Ukraine	SSP	Before 1st year	36–72	16	25	31	44
				36–72	19	58	27	16
Dobrova-Krol et al. (2010), HIV	Ukraine	SSP	Before 1st year	36–72	13	31	23	47
				36–72	16	44	19	38
Herrerros (2009)	Chile	SSP	n.a.	10–47	41	51	17	32
				12–18	41*	62	23	15
Katsurada (2007)	Japan	ASCT	After 1st year	48–72	16	0	50	50
				48–72	16	31	38	31
St. Petersburg Team (2008)	Petersburg	SSP	Before 1st year	11–18	64	0	14	86
				12–18	64*	62	23	15
Torres et al. (2012)	Portugal	ASCT	After 1st year	48–96	19	5	79	16
				61–88	72	73	24	3
Voria et al. (2003)	Greece	SSP	Before 1st year	11–17	86	22	9	69
				11–17	41	32	27	41
Zeanah et al. (2005)	Bucharest	SSP	Before 1st year	12–31	95	19	3	78
				12–31	50	74	4	22

Note: B=secure attachment; A/C=insecure attachment; D/CC=disorganized/cannot classify attachment; SSP=Strange Situation Procedure; MCAST=Manchester Child Attachment Story Completion Task; ASCT=Attachment Story Completion Task.

living in an institution at the attachment assessment phase; and (c) the term residential referred to psychiatric hospitals or other mental-health facilities. Following these criteria, our search yielded nine studies reported in eight papers. As two papers (see Bakermans-Kranenburg, Dobrova-Krol, & van Ijzendoorn, 2012; Dobrova-Krol et al., 2010) were partially based on the same group of children, the one with the most detailed information about the attachment distribution and sample features was included (Dobrova-Krol et al., 2010), resulting in seven papers. Finally, we searched the reference lists to check for possible missing studies and/or unpublished manuscripts. We identified two unpublished Ph.D. theses (Archer, 2012; Herrerros, 2009, 2013). Of the groups in Archer's unpublished manuscript (Archer, 2012), two involved in an intervention program, were omitted. This results in a total of 10 studies published in nine papers. Seven of 10 resulting studies used the (adapted) Strange Situation Procedure (SSP, Ainsworth et al., 1978), a well-known observational measure; and three used a story stem technique, i.e. the Manchester Child Attachment Story Task (MCAST, Green, Stanley, Smith, & Goldwyn, 2000) or the (adapted) Attachment Story Completion Task (ASCT, Bretherton, Ridgeway, & Cassidy, 1990; see Table 1). In sum, to the studies included in Bakermans-Kranenburg et al.'s review (2011) on attachment in children in institutions, we added the studies of Katsurada (2007), Torres and colleagues (Torres et al., 2012), and Barone and colleagues (Barone et al., 2015); all investigated attachment using a representational assessment method. Adding these articles allowed us to include the type of assessment procedure as a moderator in the data analysis.

Articles identified as eligible are reported in Table 1. The moderating variables, also shown, were selected for the reasons given in the introduction section and because they were reported in all studies but one (Herrerros, 2009, age at entry). Given the relative small number of studies, it would not have been possible to statistically test them otherwise. We analyzed data on a total of 399 institutionalized children from Chile, China, Greece, Japan, Portugal, Romania, and Ukraine, with around half of the studies carried out in the two Eastern European countries.

### Effect Size Computation

All studies but two compared their data with a control group of family-reared children. For the two that did not (Barone et al., 2015; The St. Petersburg-USA Orphanage Research Team, 2008), we obtained normative data from multicenter or meta-analytic attachment studies according to the assessment procedure used, i.e., observational (van Ijzendoorn, 1995; van Ijzendoorn, Schuengel, & Bakermans-Kranenburg, 1999) or representational (Barone et al., 2009). To avoid inflating statistical analyses with too big of sample sizes, the number of children in each attachment category in the new normative comparison group was computed to maintain the same distribution, but with a total group size equal to that of the institutionalized group.

Given that not all studies differentiate between insecure attachment subcategories (see Torres et al., 2012), the insecure-ambivalent (C) and insecure-avoidant (A) patterns were collapsed into a more general insecure category (A/C). Similarly, as both the disorganized and the cannot/classify pattern are considered at risk for the quality of subsequent development and have potentially common developmental pathways, following the convention in the field (Zeanah et al., 2005), the two categories were collapsed into a single disorganized pattern (D/CC). For each study, we calculated the chi-square statistic

**Table 2**Chi-square, Cohen's *d* effect size (*d*) and variance for the between group comparison.

Study	N	Insecure distribution			Disorganized distribution		
		$\chi^2$	<i>d</i>	var	$\chi^2$	<i>d</i>	var
Archer (2012)	71	5.94	0.60	0.06	13.45	0.96	0.07
Barone et al. (2015)	78	14.64	0.96	0.06	13.04	0.89	0.06
Dobrova-Krol et al. (2010)	35	2.61	0.56	0.13	2.10	0.50	0.13
Dobrova-Krol et al. HIV	29	0.11	0.12	0.14	0.01	0.03	0.14
Herreros (2009)	82	0.58	0.17	0.05	2.33	0.34	0.05
Katsurada (2007)	32	3.79	0.72	0.15	0.52	0.25	0.13
St. Petersburg Team (2008)	128	54.64	1.72	0.05	61.57	1.92	0.06
Torres et al. (2012)	91	26.34	1.27	0.06	2.72	0.35	0.05
Vorria et al. (2003)	127	0.90	0.17	0.03	7.42	0.50	0.03
Zeanah et al. (2005)	145	39.86	1.23	0.04	39.92	1.23	0.04

for secure (B) vs. non-secure and disorganized (A/C and D/CC), and then for organized (B and A/C) vs. disorganized (D/CC). This yielded what we refer to as the insecure and disorganized attachment distribution.

Next, we transformed the chi-square statistic about the between-group comparison into Cohen's *d* using the formula  $d = (2r/\sqrt{(1-r^2)})$  where  $r = \sqrt{\chi^2/n}$ . According to Cohen's (1988) criteria, values of 0.20, 0.50, and 0.80 represent small, moderate, and large effect sizes, respectively. Table 2 shows chi-square and Cohen's *d* values for the insecure and disorganized attachment distribution for each study. In estimating the overall Cohen's *d* and in testing the moderators, we relied on a fixed-effect model because of the relative small number of studies.

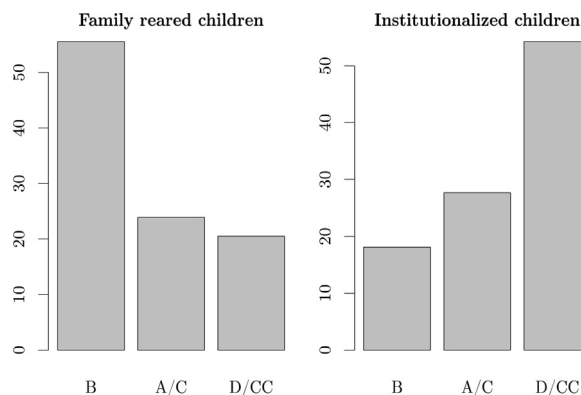
## Results

### Attachment Distribution

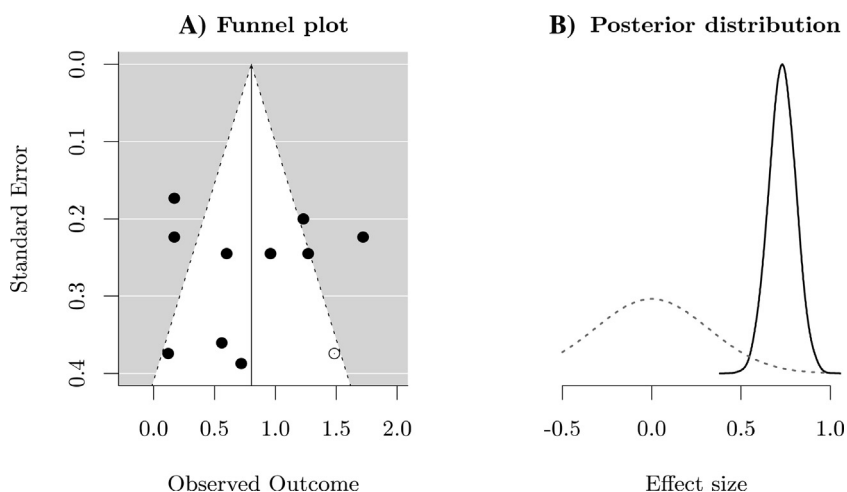
Overall attachment distribution for the 399 institutionalized children we included was as follows: around 18% secure (B), 28% insecure (A/C) and 54% disorganized/cannot classify (D/CC). The attachment distribution for the overall control group of family-reared children was comparable to that reported for the low-risk normative population in previous meta-analytic studies (van Ijzendoorn, 1995; van Ijzendoorn et al., 1999) at: 56% secure (B), 24% insecure (A and C), and 21% disorganized/cannot classify (D and CC). Fig. 1 shows total overall attachment distributions (attachment distribution for each study is reported in Table 1).

### Are Institutionalized Children More Insecure Than Their Peers?

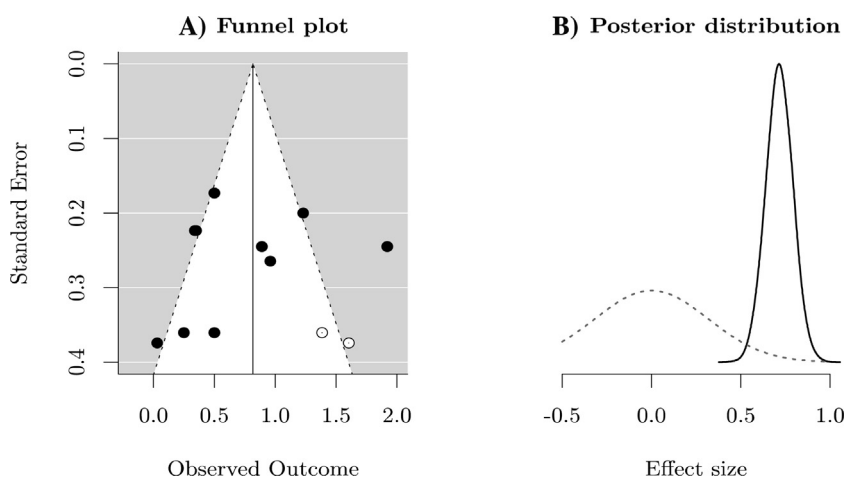
A medium positive effect size for the insecure attachment distribution (i.e., B vs. A/C and D/CC) was found  $d = 0.77$  (95% CI [0.62, 0.92]). The trim and fill results, reported in the funnel plot in Fig. 1, show that publication bias was actually trivial. The fail-safe number (representing number of studies that have to be added to reduce the significance of meta-analysis) was very high  $k = 343$ . Using the jackknife procedure we obtained the same estimate of the overall effect size, i.e.,  $d_j = 0.77$  (95% CI [0.67, 0.85]). In the Bayesian framework, we adopted a sceptical prior setting the true fixed effect distribution as follows:  $\theta \sim (0, \sigma^2)$  setting  $\sigma^2 = 1/10$ , in which 10 refers to the prior precision parameter. Fig. 2 depicts the prior (gray dotted line) and the posterior effect size distributions based on 10,000 Markov chain Monte Carlo (MCMC) iterations. The estimated



**Fig. 1.** Percentage distribution of attachment patterns: secure (B), insecure (A/C) and disorganized (D/CC).



**Fig. 2.** Insecure attachment. (A) Funnel plot: black dots are observed  $d$  as a function of standard error. White dot represents a missing study; (B) posterior distribution of effect (mean = 0.73, HDI = [0.58–0.88]); gray dotted line represents the sceptical prior.



**Fig. 3.** Disorganized attachment. (A) Funnel plot: black dots are observed  $d$  as a function of standard error. White dots represent missing studies; (B) posterior distribution of effect (mean = 0.72, HDI = [0.57–0.86]); gray dotted line represents the sceptical prior.

effect size was  $d_B = 0.73$  (HDI = 0.58–0.88). Institutionalized children thus appear to be more insecure than their peers, with comparable results obtained in both statistical approaches employed: the classical meta-analytic and the Bayesian.

#### *Are Institutionalized Children More Disorganized Than Their Peers?*

Next, we investigated the effect size for the disorganized distribution compared to the organized (i.e., D/CC vs. B and A/CC). A medium effect size of  $d = 0.76$  (95% CI [0.61, 0.91]) was found by the classical meta-analytic approach. The funnel plot (Fig. 3) shows an estimated number of 2 missing studies on the right side. Nevertheless, the fail-safe number was again high, i.e.,  $k = 310$ . The effect size and CIs estimated by the jackknife procedure were slightly lower: i.e.,  $d_j = 0.72$  (95% CI [0.61, 0.78]). Results derived from the Bayesian approach, with a sceptical prior adopted (as for distribution of the insecure category), yielded similar results. Fig. 3 shows effect size posterior distributions based on 10,000 MCMC iterations. The estimated effect size was  $d_B = 0.72$  (HDI = 0.57–0.86); thus only slightly lower than that obtained within the classical approach. The evidence again favored a higher prevalence of disorganized attachment in institutionalized children compared with their normative peers.

#### *What Moderators Affect the Insecure and Disorganized Attachment Distribution?*

We also tested a set of four moderators – country of origin (Eastern European vs. non-Eastern European countries), the instrument used for investigating attachment (observational assessment procedures vs. story stem techniques), age at institution entry (before or after the first birthday), and age at assessment (children aged 1–3 years old vs. children aged 3–8).

**Table 3**

Moderating variables: Cohen's  $d$  effect size ( $d$ ) and its associated 95% Confidence Interval ( $CI_l$  and  $CI_u$ ),  $Q$  statistic test of Moderators (and associated  $p$ -value), Bayesian effect size ( $d_B$ ) and its associated Highest Density Interval (HDI).  $b_0$  refers to model intercept (i.e., reference group parameter: country = East Europe; instrument = observational; age at entry = before 1st birthday; age at assessment = 1–3 years old),  $b_1$  represents difference between the reference and other group (i.e., country = non-East Europe; instrument = representational; age at entry = after 1st birthday; age at assessment = 3–8 years old).

Moderators		Cohen's $d$	$CI_l$	$CI_u$	$Q$	$p$	$d_B$	HDI <sub>l</sub>	HDI <sub>u</sub>
<i>Insecure</i>									
Country	$b_0$	1.13	0.90	1.35			1.13	0.90	1.35
	$b_1$	−0.65	−0.95	−0.34	17.53	0.00	−0.65	−0.95	−0.34
Instrument	$b_0$	0.69	0.52	0.86			0.69	0.51	0.86
	$b_1$	0.36	0.01	0.72	3.98	0.05	0.36	0.01	0.71
Age at entry	$b_0$	0.78	0.60	0.97			0.78	0.61	0.98
	$b_1$	0.27	−0.10	0.63	2.08	0.15	0.27	−0.12	0.61
Age at assessment	$b_0$	0.73	0.55	0.92			0.73	0.55	0.91
	$b_1$	0.13	−0.19	0.45	0.60	0.44	0.13	−0.19	0.45
<i>Disorganized</i>									
Country	$b_0$	1.12	0.89	1.34			1.11	0.88	1.34
	$b_1$	−0.63	−0.94	−0.33	16.54	0.00	−0.63	−0.92	−0.31
Instrument	$b_0$	0.84	0.66	1.01			0.84	0.67	1.01
	$b_1$	−0.30	−0.65	0.04	2.99	0.08	−0.30	−0.65	0.03
Age at entry	$b_0$	0.93	0.74	1.13			0.93	0.74	1.13
	$b_1$	−0.40	−0.75	−0.05	4.92	0.03	−0.40	−0.74	−0.05
Age at assessment	$b_0$	0.91	0.73	1.10			0.92	0.73	1.10
	$b_1$	−0.44	−0.76	−0.13	7.59	0.01	−0.45	−0.74	−0.11

The results are summarized in Table 3. The intercept, i.e., the parameter estimated in the reference categories is referred to as  $b_0$ ; and  $b_1$  is the difference between the reference and the comparison group. A positive value for  $b_1$  means that the comparison group has a greater effect size than the reference group; a negative value means the opposite.

Classical meta-analysis results showed that children in the Eastern European institutions were more often insecure and disorganized; story stem techniques assessing mental representations of attachment were associated with a higher prevalence of insecure attachment; while a younger age at assessment and a younger age at entry into an institution were associated with disorganization. The results of Bayesian analysis (see  $d_B$  values, Table 3), gave similar effect sizes. More details on Bayesian model definition are provided in the Appendix.

## Discussion

There is an increasing body of evidence to show that attachment may be compromised in institutionalized children, including our own data and those in the studies reviewed. Such results are of interest to policy makers and child welfare organizations, but to draw compelling conclusions, given the relatively few studies published so far, larger data sets and further studies are needed.

A meta-analysis, representing an objective and quantitative methodology approach for synthesizing data, allows one to summarize the research state of the art about data and to identify new directions and guidelines for further studies. We conducted a meta-analysis on data from 10 studies to explore the influence of life in institutions on children's attachment and tested a set of key moderators associated with insecure and disorganized attachment patterns. To verify our results, in view of the scarcity of data available, we used the Bayesian approach to meta-analysis in addition to the classical one. Bayesian statistics confirmed the results we obtained using the classical meta-analytic approach, firmly supporting the conclusion that life in institutions is a risk factor for insecure and disorganized attachment. Interestingly, the effect size obtained for attachment distribution was the same as that reported by a meta-analysis on maltreated children (Cyr, Esuer, Bakermans-Kranenburg, & van IJzendoorn, 2010), suggesting that in terms of attachment, life in institution has similar outcomes to maltreatment or, alternatively, that institutionalized children experienced life in maltreating family contexts before the institution placement. Addressing whether it is life in institutions or previous traumatic experience that impacts more would be possible using a randomized approach, as Nelson did in investigating the cognitive outcomes for institutionalized children vs. previously institutionalized adoptees (Nelson et al., 2007). Nevertheless, this analysis suggests that life in institutions does not favor recovery, whereas moving into adoptive or foster care families can lead to a significant (although not always complete) recovery (van den Dries et al., 2009). Despite all the evidence and recommendations (Dozier et al., 2014; Unicef, 1989), a lot of work remains to be done to ensure that children actually are moved into a sensitive family-environment in the absence of a stable and caring biological family. The high prevalence of insecure and disorganized rates identified in children reared in institutions requires attention not only to improve the current quality of children's development but also because of long-term consequences that non-secure patterns, especially the disorganized pattern, have on subsequent development in terms of negative social-emotional outcomes (Pasco Fearon & Belsky, 2011; Lyons-Ruth & Jacobvitz, 2008).

In terms of moderating variables, Eastern European countries and instruments assessing attachment at a representational level were associated with higher rates of insecure patterns. Risk for disorganized attachment was associated with Eastern European countries of origin, entering an institution before the first birthday, and being aged less than 3 years at the



attachment assessment phase. The high rates of attachment insecurity among children in Eastern European countries could result from the unfavorable caregiver-to-child ratio. For example, in Zeanah and colleagues study (Zeanah et al., 2005), in Bucharest, the ratio was 1:12; whereas in Vorria et al.'s study (2003), in Greece, it was 1:4/6. However, this is speculative: caregiver-to-child ratio was not included in the meta-analysis because data were not available for all studies. Regarding age at entry into an institution and age at assessment, our data seem to support the notion of a sensitive period in attachment development. The early experience hypothesis postulates that profound changes in brain development known to occur during the first years of life lead to greater sensitivity to the environmental influences (Sheridan & Nelson, 2009). It is indeed during the first year of life that attachment patterns are consolidated and become observable; being placed in an institution early in life may threaten or prevent the development of an organized pattern, leading to a higher rate of disorganized/cannot classify category in younger children. These data thus support a policy of avoiding institutional settings and placing each child in a family environment as soon as possible. Concerning the moderating role of attachment assessment procedures, our data suggest that type of procedure (behavioral or representational) may influence the results obtained for the secure/insecure categories, with a high rate of insecure patterns reported in studies using representational procedures. Nevertheless, this data should be considered with caution: studies using a representational assessment method, and included in the current meta-analysis, are few in number for reaching a definitive conclusion. Further research, addressing the validity of attachment measures in atypical context such as institution, is definitely needed.

In addition to these results, a few questions arose from our review which offer new directions for future research. First, the validity of attachment measures in institutions should be established and improved for the assessment of attachment in such high risk and non-normative contexts. Our meta-analysis suggested that the type of instrument used might be a moderating variable. Whether this is because some measures are more accurate than others or because attachment presents differences at the behavioral level with respect to the representational level in such a population is unknown. Zeanah, Carlson and colleagues' (Zeanah et al., 2005) likert-scale for atypical behavior at the Strange Situation, mentioned in the introduction section, was a preliminary effort to resolve the issue of validity. We believe that this area would benefit from a further systematic effort to apply such a scale on a larger, multicenter sample and/or to compare attachment assessment procedures by testing their psychometric proprieties in institutions. Second, it is still unclear to what extent the disorganized/cannot classify attachment patterns equate to an attachment disorder (RAD) and only a few studies have addressed this issue, as noted in the review. Given the relevance in the clinical field of the RAD label, and the negative outcomes reported for the disorganized attachment patterns in the attachment literature, collaboration between researchers and practitioners on studies to better understand the similarities and differences between the two constructs would be beneficial. Lastly, in our meta-analysis it was impossible to address other relevant moderating variables (e.g., the quality of the environment, child-to-caregiver ratio, the professional caregiver's sensitivity) because of the heterogeneity and scarcity of studies. A common protocol shared by a wide network of researchers to investigate an agreed upon set of candidate moderating variables would enable reliable analysis of what factors influence attachment in institutionalized children.

In this article, we shed further light on the risk of insecure and disorganized attachment in institutions and suggested new directions for future studies. Our findings suggest that Bowlby's belief that children should be reared in adequate family environments was correct, and thus, policies should be developed to promote the use of family environments.

## Acknowledgments

The authors would like to thank the thoughtful work of the anonymous reviewers and Marinus H. van IJzendoorn for his preliminary comments on a first draft of this paper.

## References

- Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation*. Hillsdale, NJ: Erlbaum.
- Archer, M. (2012). *Attachment in institutionalised and community children in China* (Ph.D. thesis). University College London (UCL).
- Bakermans-Kranenburg, M. J., Dobrova-Krol, N. A., & van IJzendoorn, M. H. (2012). Impact of institutional care on attachment disorganization and insecurity of Ukrainian preschoolers Protective effect of the long variant of the serotonin transporter gene (5HTT). *International Journal of Behavioral Development*, 36, 11–18.
- Bakermans-Kranenburg, M. J., Steele, H., Zeanah, C. H., Muhamedrahimov, R. J., Vorria, P., Dobrova-Krol, N. A., Steele, M., van IJzendoorn, M. H., Juffer, F., & Gunnar, M. R. (2011). III. Attachment and emotional development in institutional care: Characteristics and catch up. *Monographs of the Society for Research in Child Development*, 76, 62–91.
- Barlow, J., van der Voort, A., Juffer, F., & Bakermans-Kranenburg, M. (2014). Sensitive parenting is the foundation for secure attachment relationships and positive social-emotional development of children. *Journal of Children's Services*, 9, 165–176.
- Barone, L., Bramante, A., Lionetti, F., & Pastore, M. (2014). Mothers who murdered their child: An attachment-based study on filicide. *Child Abuse & Neglect*, 38, 1468–1477.
- Barone, L., Del Giudice, M., Fossati, A., Manaresi, F., Perinetti, B. A., Colle, L., & Veglia, F. (2009). Psychometric properties of the Manchester Child Attachment Story Task: An Italian multicentre study. *International Journal of Behavioral Development*, 33, 185–190.
- Barone, L., Dellagiulia, A., & Lionetti, F. (2015). When the primary caregiver is missing: Investigating proximal and distal variables involved in institutionalized children's adjustment. *Child Abuse Review*, <http://dx.doi.org/10.1002/car.2365>
- Barone, L., & Lionetti, F. (2012). Attachment and social competence: A study using MCAST in low-risk Italian preschoolers. *Attachment & Human Development*, 14, 391–403.
- Bowlby, J. (1951). *Maternal care and mental health*. Geneva: World Health Organization.
- Bowlby, J. (1969). *Attachment and loss. Vol. I: Attachment*. Hogarth Press.
- Bretherton, I., Ridgeway, D., & Cassidy, J. (1990). *Assessing internal working models of the attachment relationship. Attachment in the preschool years: Theory, research, and intervention*. University of Chicago Press.

- Carlson, E. A. (1998). A prospective longitudinal study of attachment disorganization/disorientation. *Child Development*, 69, 1107–1128.
- Carlson, E. A., Hostinar, C. E., Mliner, S. B., & Gunnar, M. R. (2014). The emergence of attachment following early social deprivation. *Development and Psychopathology*, 26, 479–489.
- Cassidy, J., & Shaver, P. (2008). *Handbook of attachment: Theory, research, and clinical applications*. New York: Guilford Press.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Psychology Press.
- Cyr, C., Euser, E. M., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2010). Attachment security and disorganization in maltreating and high-risk families: A series of meta-analyses. *Development and Psychopathology*, 22, 87–108.
- Dobrova-Krol, N. A., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., & Juffer, F. (2010). The importance of quality of care: Effects of perinatal HIV infection and early institutional rearing on preschoolers' attachment and indiscriminate friendliness. *Journal of Child Psychology and Psychiatry*, 51, 1368–1376.
- Dozier, M., Kaufman, J., Kobak, R., O'Connor, T. G., Sagi-Schwartz, A., Scott, S., Shaffer, C., Smetana, J., van IJzendoorn, M. H., & Zeanah, C. H. (2014). Consensus statement on group care for children and adolescents: A statement of policy of the American Orthopsychiatric Association. *American Journal of Orthopsychiatry*, 84, 219–225.
- Duval, S. (2005). In H. R. Rothstein, A. J. Sutton, & M. Borenstein (Eds.), *The trim and fill method, in publication bias in meta-analysis: Prevention, assessment and adjustments*. Chichester, UK: John Wiley & Sons, Ltd.
- Duval, S., & Tweedie, R. (2000a). A nonparametric trim and fill method of accounting for publication bias in meta-analysis. *Journal of the American Statistical Association*, 95, 89–98.
- Duval, S., & Tweedie, R. (2000b). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, 56, 455–463.
- Egger, M., Smith, G. D., & Altman, D. (2008). *Systematic reviews in health care: Meta-analysis in context*. UK: John Wiley & Sons.
- Emde, R. N., Wolf, D., & Oppenheim, D. (2003). *Revealing the inner worlds of young children: The MacArthur story stem battery and parent-child narratives*. New York: Oxford University Press.
- Engle, P. L., Groza, V. K., Groark, C. J., Greenberg, A., Bunkers, K. M., & Muhamedrahimov, R. J. (2011). VIII. The situation for children without parental care and strategies for policy change. *Monographs of the Society for Research in Child Development*, 76, 190–222.
- Euser, S., Alink, L. R., Tharner, A., van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2013). The prevalence of child sexual abuse in out-of-home care: A comparison between abuse in residential and in foster care. *Child Maltreatment*, 18, 221–231.
- Green, J., Stanley, C., Smith, V., & Goldwyn, R. (2000). A new method of evaluating attachment representations in young school-age children: The Manchester Child Attachment Story Task. *Attachment & Human Development*, 2, 48–70.
- Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Steele, R. D., & Roisman, G. I. (2014). The significance of attachment security for children's social competence with peers: A meta-analytic study. *Attachment & Human Development*, 16, 103–136.
- Groh, A. M., Roisman, G. I., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., & Fearon, R. (2012). The significance of insecure and disorganized attachment for children's internalizing symptoms: A meta-analytic study. *Child Development*, 83, 591–610.
- Grossmann, K., Bretherton, I., Waters, E., & Grossmann, K. (2013). Maternal sensitivity: Observational studies honouring Mary Ainsworth's 100th year. *Attachment & Human Development*, 15, 443–447.
- Groza, V. K., Bunkers, K. M., & Gamer, G. N. (2011). VII. Ideal components and current characteristics of alternative care options for children outside of parental care in low-resource countries. *Monographs of the Society for Research in Child Development*, 76, 163–189.
- Herreros, F. (2009). *Attachment security of infants living in a Chilean orphanage*. Poster session presented at The biennial meeting of the society for research in child development.
- Herreros, F. (2013). *An investigation of the attachment formation and organization of infants living in Chilean institutions* (Ph.D. thesis). New York: The New School.
- Juffer, F., Palacios, J., Le Mare, L., Sonuga-Barke, E. J., Tieman, W., Bakermans-Kranenburg, M. J., Vorria, P., van IJzendoorn, M. H., & Verhulst, F. C. (2011). II. Development of adopted children with histories of early adversity. *Monographs of the Society for Research in Child Development*, 76, 31–61.
- Katsurada, E. (2007). Attachment representation of institutionalized children in Japan. *School Psychology International*, 28, 331–345.
- Kruschke, J. K. (2013). Bayesian estimation supersedes the *t* test. *Journal of Experimental Psychology: General*, 142, 573.
- Lionetti, F. (2014). What promotes secure attachment in early adoption? The protective roles of infants temperament and adoptive parents attachment. *Attachment & Human Development*, 16, 573–579.
- Lionetti, F., Pastore, M., & Barone, L. (2015). Parenting stress: The roles of attachment states of mind and parenting alliance in the context of adoption. *Parenting: Science and Practice*, <http://dx.doi.org/10.1080/15295192.2015.1020142>
- Liotti, G. (2011). Attachment disorganization and the controlling strategies: An illustration of the contributions of attachment theory to developmental psychopathology and to psychotherapy integration. *Journal of Psychotherapy Integration*, 21, 232–252.
- Lyons-Ruth, K., & Jacobvitz, D. (2008). Attachment disorganization: Genetic factors, parenting contexts, and developmental transformation from infancy to adulthood. In J. Cassidy, & P. Shaver (Eds.), *Handbook of attachment*. New York: Guilford Press.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine*, 151, 264–269.
- Mullen, B. (1989). *Advanced basic meta-analysis*. Hillsdale, NJ: Erlbaum.
- Nelson, C. A., Zeanah, C. H., Fox, N. A., Marshall, P. J., Smyke, A. T., & Guthrie, D. (2007). Cognitive recovery in socially deprived young children: The Bucharest Early Intervention Project. *Science*, 318, 1937–1940.
- O'Connor, T. G., Parfitt, D. B., & Zeanah, C. (2009). Applying research findings on early experience to infant mental health. In *Handbook of infant mental health*.
- O'Connor, T. G., & Zeanah, C. H. (2003). Attachment disorders: Assessment strategies and treatment approaches. *Attachment & Human Development*, 5, 223–244.
- Pasco Fearon, R., & Belsky, J. (2011). Infant–mother attachment and the growth of externalizing problems across the primary-school years. *Journal of Child Psychology and Psychiatry*, 52, 782–791.
- Plummer, M. (2003). JAGS: A program for analysis of Bayesian graphical models using Gibbs sampling. In *Proceedings of the 3rd international workshop on distributed statistical computing (DSC 2003)* March, (pp. 20–22).
- Plummer, M. (2014). *rjags: Bayesian graphical models using MCMC. R package version 3-13*. URL: <http://cran.r-project.org/package=rjags>
- R Core Team. (2013). *R: A language and environment for statistical computing*. Austria: R Foundation for Statistical Computing Vienna. URL: <http://www.r-project.org>
- Save the Children. (2009). *The risk of harm to young children in institutional care*. UK: The Save the Children Fund.
- Sheridan, M., & Nelson, C. A. (2009). *Neurobiology of fetal and infant development. Handbook of infant mental health* (Vol. 3).
- Smyke, A. T., Zeanah, C. H., Fox, N. A., Nelson, C. A., & Guthrie, D. (2010). Placement in foster care enhances quality of attachment among young institutionalized children. *Child Development*, 81, 212–223.
- Soares, I., Belsky, J., Oliveira, P., Silva, J., Marques, S., Baptista, J., & Martins, C. (2014). Does early family risk and current quality of care predict indiscriminate social behavior in institutionalized Portuguese children? *Attachment & Human Development*, 16, 137–148.
- Spiegelhalter, D. J. (2004). Incorporating Bayesian ideas into health-care evaluation. *Statistical Science*, 19, 156–174.
- Spiegelhalter, D. J., Abrams, K. R., & Myles, J. P. (2004). *Bayesian approaches to clinical trials and health-care evaluation*. UK: John Wiley & Sons.
- Stoltenborgh, M., Bakermans-Kranenburg, M. J., Alink, L. R., & van IJzendoorn, M. H. (2015). The prevalence of child maltreatment across the globe: Review of a series of meta-analyses. *Child Abuse Review*, 24, 37–50. <http://dx.doi.org/10.1002/car.2353>
- Stoltenborgh, M., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2013). The neglect of child neglect: A meta-analytic review of the prevalence of neglect. *Social Psychiatry and Psychiatric Epidemiology*, 48, 345–355.

- The St. Petersburg-USA Orphanage Research Team. (2008). The effects of early social–emotional and relationship experience on the development of young orphanage children. The St. Petersburg-USA Orphanage Research Team. *Monographs of the Society for Research in Child Development*, 73, vii–295.
- Tizard, B., & Hodges, J. (1978). The effect of early institutional rearing on the development of eight year old children. *Journal of Child Psychology and Psychiatry*, 19, 99–118.
- Tizard, B., & Rees, J. (1975). The effect of early institutional rearing on the behaviour problems and affectional relationships of four-year-old children. *Journal of Child Psychology and Psychiatry*, 16, 61–73.
- Torres, N., Maia, J., Veríssimo, M., Fernandes, M., & Silva, F. (2012). Attachment security representations in institutionalized children and children living with their families: Links to problem behaviour. *Clinical Psychology & Psychotherapy*, 19, 25–36.
- Tukey, J. W. (1958). Bias and confidence in not-quite large samples. *Annals of Mathematical Statistics*, 614.
- Unicef. (1989). *Convention on the rights of the child*. UNICEF.
- United Nations General Assembly. (2010). *Guidelines for the alternative care of children: Resolution/adopted by the General Assembly, 24 February 2010*. Technical Report A/RES/64/142. <http://www.unhcr.org/refworld/docid/4c3acd162.html> Accessed 30.01.13
- van de Schoot, R., Kaplan, D., Denissen, J., Asendorpf, J. B., Neyer, F. J., & van Aken, M. A. (2013). A gentle introduction to Bayesian analysis: Applications to developmental research. *Child Development*, 85, 842–860.
- van den Dries, L., Juffer, F., van IJzendoorn, M. J., & Bakermans-Kranenburg, M. H. (2009). Fostering security? A meta-analysis of attachment in adopted children. *Children and Youth Services Review*, 31, 410–421.
- 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.
- van IJzendoorn, M. H., & Bakermans-Kranenburg, M. J. (2003). Attachment disorders and disorganized attachment: Similar and different. *Attachment & Human Development*, 5, 313–320.
- van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, 11, 225–250.
- Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software*, 36, 1–48. URL: <http://www.jstatsoft.org/v36/i03>
- Vorria, P., Papaligoura, Z., Dunn, J., van IJzendoorn, M. H., Steele, H., Kontopoulou, A., & Sarafidou, Y. (2003). Early experiences and attachment relationships of Greek infants raised in residential group care. *Journal of Child Psychology and Psychiatry*, 44, 1208–1220.
- Wagenmakers, E. J., Wetzels, R., Borsboom, D., & van der Maas, H. (2011). Why psychologists must change the way they analyze their data: The case of psi. *Journal of Personality and Social Psychology*, 100, 426–432.
- Weinfield, N. S., Sroufe, L. A., Egeland, B., & Carlson, E. (2008). Individual differences in infant–caregiver attachment: Conceptual and empirical aspects of security. In J. Cassidy, & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., Vol. 3, pp. 78–101). New York: Guilford Press.
- Zeanah, C. H., Smyke, A. T., Koga, S. F., & Carlson, E. A. (2005). Attachment in institutionalized and community children in Romania. *Child Development*, 76, 1015–1028.

## Appendix.

JAGS code for fixed effects model via Bayesian estimation method was as follows:

```
model {
  for (i in 1:n)
  {d[i] ~ dnorm(theta,precision.d[i]) # likelihood
  precision.d[i] <- 1/var.d[i]
  } theta ~ dnorm(0,10) # skeptical prior
}
```

where  $n = 10$  is the number of studies,  $d$  and  $var.d$  are estimated effect sizes and variances respectively and  $\theta$  represented model parameter.

For each moderator the model code was:

```
model {
  for (i in 1:n) {
    d.hat[i] <- vb0 + b1*x[i]
    d[i] ~ dnorm(d.hat[i],precision.d[i]) # likelihood
    precision.d[i] <- 1/var.d[i]
  }
  b0 ~ dnorm(0,.01) # b0 prior
  b1 ~ dnorm(0,.01) # b1 prior
}
```

where  $n = 10$  is the number of studies,  $d$  and  $var.d$  are estimated effect sizes and variances respectively,  $x$  the moderator variable and  $b0$  and  $b1$  the model parameters (intercept and slope, respectively).