Increases in parental investment and child health as a result of an early intervention

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ABSTRACT

Parental investment (involving time or money invested in 3-year-olds) and child health were assessed as an outcome of (a) children's risk status (preterm vs. full-term birth) and (b) maternal resources (defined here in terms of their problem-solving skills in resolving caregiving challenges). Resources were varied systematically as a function of maternal participation in a traditional home visitation program versus a novel cognitively enhanced program that facilitated parenting skills more successfully. As predicted, mothers in the traditional home visitation condition invested preferentially in low-risk children, whereas mothers in the cognitively enhanced condition invested preferentially in high-risk children (who, in turn, showed maximal health benefits). Maternal investment of time in care provision mediated the relationship between predictor variables and children's health. This pattern supports an evolutionary model of parental investment in which parents show discriminative solicitude based on the reproductive potential of the child and parents' access to relevant resources.

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Introduction

The concept of parental investment in children has received attention from different theoretical frameworks that often have little contact with each other. The most prominent examples include economic theory and evolutionary psychology. Becker (1991) applied his economic theories to the processes that operate within family households. He addressed the issue of the expenditure of scarce resources on children in terms of their ultimate utility function, with the understanding that children
are both costly and valuable. At its heart, the approach focuses on rationality within investment decisions. Parents are seen as investing in children (as opposed to other ways of allocating scarce time and economic resources) based on ways that optimize their own outcomes. However, in this approach, attention is not given to differential investment in children based on their characteristics.

In contrast, evolutionary theory has focused considerable attention on discriminative parental solicitude, that is, the differential investment of time and resources in children who differ in their reproductive value (Daly & Wilson, 1987). Whereas economic theory focuses on investment patterns that optimize parents’ outcomes at the current time, evolutionary theory focuses on investment patterns that optimize parents’ long-term reproductive success. Thus, parents may selectively invest in children who carry the greatest potential for reaching adulthood and procreating successfully, thereby enhancing parents’ reproductive success. The computational mechanisms in proposed evolutionary investment strategies (and their genetic underpinnings) are maintained on the basis of natural selection. Selection processes foster the development of strategies that have been adaptive across a species’ evolutionary history.

Both economic theory and evolutionary theory give weight to the differential effects of parental resources. That is, parents are more likely to invest in children when they have the resources to do so. Whereas economic theory is more likely to focus on decisions with respect to the effect of resources on the number of children produced, evolutionary theory is concerned with the effects of resources on discriminative investment patterns in children who differ in their reproductive value (i.e., children’s ability to convert parental resources into reproductive success).

**Parental investment theory**

It has been proposed that parental investment is organized according to a zero-sum allocation of resources (Trivers, 1972, 1974). Thus, the more a parent invests in one offspring, the fewer the resources that will be available to invest in other offspring and/or future offspring.

Daly and Wilson (1984, 1988) provided evidence for the presence of parental investment mechanisms. For example, children with low reproductive potential are at higher risk for maltreatment, neglect, and/or infanticide (Daly & Wilson, 1984). Also, parents with low resources (economic or social) are more likely than parents with higher resources to neglect or abuse their children (Garbarino, 1985). Consistent with these findings, Bereczkei (2001) found that mothers shorten the duration of breast-feeding more with high-risk infants than with low-risk infants. Ultimately, the more resources mothers invest in infants, the more likely the infants are not only to survive but also to successfully reproduce themselves, thereby passing along their genes (Costancia, Kelsey, & Reik, 2004).

Important insights into the nature of parental investment are provided by evidence from nonhumans. In a simulation study, mother birds were found to optimize their reproductive success by differentially investing in high- versus low-value chicks based on the mothers’ access to foraging resources (Davis & Todd, 1999). Optimal outcomes (size of the surviving brood) were found when mothers with high resources fed the smallest chicks first and mothers with low resources fed the chicks with the greatest reproductive potential first. Reviewing the nonhuman literature, Maestripieri and Carroll (1998) concluded that nonhuman mothers respond to costs and benefits posed by their offspring as well as the ability to identify the accessibility of food provisions in their environment. Based on empirical observations, Gottlander (1987) showed that some birds have the ability to alter their feeding habits depending on the accessibility of resources and the reproductive potential of their young.

Bugental and Beaulieu (2003) applied these basic formulations to humans. They specified the exact nature of parental investment by suggesting that parental resources and offspring value combine in a contingent pattern rather than an additive one. Their formulations are also consistent with the ideas presented by Mann (1992). An additive pattern (implicit in early parental investment formulations) predicts that parental resources and child value combine additively to predict investment. In contrast, a contingent pattern predicts preferential investment in low-risk (high-reproductive value) children among parents with low resources and predicts preferential investment in high-risk (low-reproductive value) children among parents with high resources. In both cases (high- and low-resource mothers), parents’ ultimate reproductive success is optimized by this contingent strategy (as documented...
by Davis & Todd, 1999). The pattern found in the work of Bugental and colleagues (Beaulieu & Bugental, 2008; Bugental & Beaulieu, 2003) and that of others is shown below (see Fig. 1).

Other supportive evidence is available for this pattern. For example, children who have craniofacial anomalies (within an advantaged population) have been found to be more likely to be securely attached to their mothers than infants lacking this problem—an apparent effect of the exceptional level of investment shown by some mothers (Coy, Speltz, & Jones, 2002). In financially advantaged countries, mothers often make exaggerated efforts to provide care for their high-risk (e.g., premature) children (Field, 1982). This pattern is typically reversed in less advantaged nonindustrial cultures where such children are at high risk for infanticide (Daly & Wilson, 1984, 1988). As a specific example, Scheper-Hughes (1985) observed that poverty-stricken mothers in the shantytowns of Brazil provided greater care and resources to children who provided cues to health (e.g., vigor) but allowed their weaker, more passive children to die of benign neglect, with the folk belief that such children were not meant to live or "chose to die."

*The current study*

In the current investigation, it was predicted that parental investment depends on (a) the risk level of offspring and (b) the acquired resources of mothers as a result of their involvement in an intervention. Although resources are typically thought of in terms of material resources (e.g., access to food), they may also involve nonmaterial resources, for example, skills. In this case, the skill involved was mothers' acquired ability to resolve challenges within the caregiving relationship.

All children in the current study shared an early history of mild/moderate medical risk. However, preterm infants were seen as posing a higher risk than full-term infants with other medical problems. In conceptualizing risk, we are thinking of the cues that would have been available in the distant evolutionary past. In the case of premature children, this includes reduced attractiveness in appearance (Maier, Holmes, Slaymaker, & Reich, 1984) and deficits in infants' self-regulation ability (Feldman, 2009; Minde, 2000), a deficit that creates an extra demand on maternal provision of care. Objectively, premature infants are at risk for physical and psychological health problems during adulthood (e.g., Nomura, Brooks-Gunn, Davey, Ham, & Fifer, 2007; Picard, Del Dotto, & Breslau, 2000); thus, the early cues that are available were accurate predictors of their reduced "reproductive value" in the evolutionary past. Parents who abandon their children at birth are likely to do so based on observable cues but rarely do so when (even extreme) health problems (as identified and reported by physicians) lack observable cues (Weiss, 1998). In addition, adults' willingness to adopt is based more on children's observable cues than on their actual health (Volk, Lukjanczuk, & Quinsey, 2007).

![Contingent model of parental investment](image-url)
Parental resources were defined in terms of the skills acquired as an outcome of an early intervention (as described in Bugental et al., 2002). Parents were randomly assigned to one of two intervention conditions. Those assigned to a traditional home visitation program were given information on child development and effective parenting tactics. In a novel “cognitively enhanced” home visitation condition, they were taught how to seek information and how to employ problem-solving tactics that they could use on their own. In conceptualizing the cognitively enhanced condition as providing a resource advantage, one can think of the proverb, “Give a man a fish and he will eat for a day. Teach a man to fish and he will eat for a lifetime.”

Mothers in the cognitively enhanced condition were expected to invest preferentially in high-risk children in that they had acquired greater skills in managing caregiving challenges and could do so without jeopardizing their own welfare or that of other current or future children. In contrast, parents in the traditional condition were predicted to invest more in low-risk children. Parental investment was measured on the basis of time and/or money allocated for high-risk versus low-risk children.

Ultimately, children’s health provides a good marker of the outcomes of parental investment strategies. It was predicted that the high-risk children whose mothers participated in the cognitively enhanced condition would be healthier at 3 years of age than would the high-risk children of mothers in the traditional home visitation condition. Long-term health outcomes were expected to be mediated by the differential pattern of parental investment (time and/or money) in high-risk versus low-risk children. As an exploratory question, an assessment was made of sex differences between parental investment patterns and ultimate health levels of high-risk infants. There is a well-known sex difference in the outcomes of high-risk children (Brothwood, Wolke, Gamsu, Benson, & Cooper, 1986; Donaldson & Kohl, 1965). The morbidity and mortality of high-risk (e.g., very low-birthweight) infants has consistently been found to be higher among boys than among girls.

Method

Research participants

The sample employed involved 64 families who had participated in a home visitation intervention described in Bugental and Schwartz (2009). Parents were referred to the program by health care professionals if their children were born prematurely, experienced birth complications, and/or had illnesses early in life (e.g., a respiratory disorder). Families were randomly assigned to one of two intervention conditions soon after the children were born. The mean age of children at intake was 9.37 weeks (SD = 5.50). Although 102 families completed the 1-year program, only 64 could be successfully located/recruited when children reached 3 years of age (the age group studied here).

The sample was predominantly Latino (88%), reflecting the composition of the community (57% of children in the county are Latino). Fully 81% of the parents were immigrants to the United States from Mexico. The mean maternal age was 27 years (SD = 6), and the mean maternal education was 9 years (SD = 4). In addition, 40% of mothers were multiparous, and 84% of families included both parents. In total, 37 children were full-term at birth (i.e., >36 weeks gestational age) and 27 children were preterm. The two child groupings are referred to here as low risk and high risk. Fully 83% of children were assigned to a neonatal intensive care unit (NICU) at birth, and 39% of the children were girls. There were no significant differences in the intake characteristics of families in the two conditions.

Procedure

Prior to the first visit, families were assigned to either the cognitively enhanced condition or the traditional home visitation condition (an intervention modeled on the Healthy Start program [Breakey & Pratt, 1991; Duggan et al., 1999]). Families in both conditions were scheduled for 20 visits spread over the period of 1 year. Home visitors were blind to the expected advantage of the cognitively enhanced condition. They received supervision on a weekly basis to ensure that differences between the distinctive methods used in the two conditions were followed, and case notes were kept to document that they had followed the protocol in each condition.
The traditional home visitation condition provided social support to the mothers along with information on ways in which they might resolve caregiving challenges. In contrast, the cognitively enhanced condition facilitated parents’ own problem-solving activities in finding ways to manage challenges in the caregiving relationship and ways to seek support or information (as described in Bugental & Schwartz, 2009; Bugental et al., 2002). During this process, mothers came to cognitively re-frame caregiving challenges as situational in nature (as opposed to making blame interpretations). Mothers initiated plans for possible resolutions they could try in resolving an identified problem and subsequently tracked the effects of their efforts.

The cognitively enhanced condition (in comparison with the traditional home visitation condition) was found to facilitate more adaptive parenting practices (Bugental & Schwartz, 2009; Bugental et al., 2002). Mothers in the cognitively enhanced condition made less use of harsh tactics and provided a safer environment for their children than was found in the traditional condition (Bugental et al., 2002). Thus, the participation in the cognitively enhanced condition (in comparison with the traditional home visitation condition) led to greater parenting skills—interpreted here as a skill-based resource.

The program continued for 1 year (as described at http://www.psych.ucsb.edu/~bugental). Although the intervention did not continue past this point, phone contact was maintained minimally during the next 2 years. Families were invited to visit the lab for a 3-year visit.

**Measures**

**Parental investment**

Mothers were asked to provide information on the ways in which they spend their time over a typical 24-h period and how they spend their money over a period of 1 month. For time allocation, they were given stickers where each sticker represented 1 h (but could be broken into half-hour units). The activity categories that did not involve the children included cooking, sleeping, cleaning, working at a job, and shopping. The two categories that involved the children were provision of care and fun activities. Each mother was asked to indicate her allocation of time for these activities with the target child (i.e., the child born at the start of the program) as well as for self and others in the family (i.e., partner and siblings).

Mothers were also provided with stickers to reflect money, with each sticker representing $50. Budget allocations to shared costs for the entire family (e.g., transportation, housing, insurance) were not included. Our analyses focused on allocation of money to expenditures for particular individuals (self and other members of the family). Budgetary allocations relevant to parental investment in particular individuals included food, entertainment, and clothes.

Correlations between all investment variables are shown in Table 1. Most variables are moderately related, suggesting a general pattern of maternal investment that transcended the expenditure of time or money.

**Child health**

Each mother was asked to report the frequency of different kinds of health problems that the target child had experienced over the past 3 months. Categories included flu, respiratory problems, diarrhea,

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Correlation between investment variables.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment in</td>
<td>Fun</td>
</tr>
<tr>
<td>Investment in care</td>
<td>.42***</td>
</tr>
<tr>
<td>Investment in fun</td>
<td>.27</td>
</tr>
<tr>
<td>Investment in clothes</td>
<td></td>
</tr>
<tr>
<td>Investment in food</td>
<td></td>
</tr>
<tr>
<td>Investment in entertainment</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
** p < .01.
insect bites, earaches, headaches, allergies, injuries, and “other.” Children’s reported health problems were not significantly related to any of the parental investment measures (after controlling for covariates). Thus, the two types of self-report measures do not appear to share common variance in the group as a whole.

Results

Analysis strategy

An analysis of covariance (ANCOVA) strategy was employed in testing the predicted interaction between child risk status (preterm vs. full-term) and intervention history on (a) parental investment and (b) child health. Follow-up analyses were conducted in all analyses to determine whether child gender showed any main or interaction effects. There were no significant effects of gender in any of the analyses.

Regression analyses were conducted to determine whether parental investment mediated the effects of predictor variables on children’s health outcomes. Three variables were included as covariates in all analyses: immigration status, presence or absence of siblings, and presence or absence of father. Family composition variables were included to control for the extent to which there was competition for allocation of time or money. Immigration status was included as a potential source of influence reflecting cultural values (e.g., Fuligni & Yoshikawa, 2004).

Effects of intervention condition and child risk on parental investment

Separate analyses were conducted to test the predicted effects of intervention condition and child risk on the five parental investment variables: investment of time in protective care, investment of time in shared fun activities, financial expenditures for food, financial expenditures for clothing, and financial expenditures for entertainment. All measures were computed as a proportion of total time on an activity or total expenditure in a category. For example, time invested in providing care for the target child was computed as a proportion of the total time spent in providing care for anyone (including self, partner, or other children). In the same way, expenditures made for the target child’s clothing were computed as a proportion of total expenditures on clothes for anyone.

Time in care provision

The ANCOVA conducted for time spent in care provision yielded a significant interaction between intervention condition and risk, $F(1, 57) = 20.70, p < .001, \eta^2 = .27$. As can be seen, the effect size of this interaction is large (as defined by Cohen, 1992). Mothers in the cognitively enhanced condition (see Table 2) demonstrated greater investment of time in care provision for high-risk children than for low-risk children; the reverse pattern was shown for mothers in the traditional home visitation condition. In addition, a main effect was found for risk, $F(1, 57), p = .01$. Overall, greater investment of time in care provision was provided to high-risk children ($M = .88, SD = .23$) than to low-risk children ($M = .76, SD = .28$).

A planned contrast analysis was conducted to test the predicted pattern of effects. A weight of 1 was assigned to high-risk children in the cognitively enhanced condition and to low-risk children in the traditional condition, and a weight of $-1$ was assigned to low-risk children in the cognitively enhanced condition and to high-risk children in the traditional condition. The analysis provided significant support for the predicted pattern of effects, $t(60) = 3.58, p = .001$.

Time in fun activities

The ANCOVA conducted for time spent in fun activities yielded a significant interaction between intervention condition and risk, $F(1, 56) = 9.41, p = .003, \eta^2 = .14$. The effect size of this interaction was large. Mothers in the cognitively enhanced condition (see Table 2) demonstrated greater investment of time in fun activities with high-risk children than with low-risk children; the reverse pattern was shown for mothers in the traditional home visitation condition. A planned contrast
analysis was conducted to test the predicted pattern of effects. The analysis yielded significant support for the predicted pattern of effects, $t(59) = 2.72$, $p = .009$.

Clothing purchases

The ANCOVA conducted for the expenditure of funds on clothing yielded an interaction that approached significance between intervention condition and child risk, $F(1, 48) = 3.94$, $p = .053$, $\eta^2 = .08$. Mothers in the cognitively enhanced condition (see Table 2) demonstrated greater investment of funds in clothing purchases for high-risk children than for low-risk children; the reverse pattern was shown for mothers in the traditional condition. However, a planned contrast conducted to test the predicted pattern of effects was not significant, $t(51) = 1.53$.

Entertainment funds

The ANCOVA conducted for the expenditure of funds for entertainment yielded a significant interaction between intervention condition and child risk, $F(1, 55) = 4.26$, $p = .04$, $\eta^2 = .07$. Mothers in the cognitively enhanced condition (see Table 2) demonstrated greater investment of funds in entertainment for high-risk children than for low-risk children; the reverse pattern was shown for mothers in the traditional condition. A planned contrast conducted to test the predicted pattern of effects was not significant, $t(58) = 1.41$.

Food purchases

The ANCOVA conducted for the expenditure of funds on food yielded only one significant effect, a main effect of intervention, $F(1, 57) = 5.74$, $p = .04$, $\eta^2 = .08$. Mothers in the traditional condition (see Table 2) allocated more funds for food for their children ($M = .35, SD = .15$) than did mothers in the cognitively enhanced condition ($M = .29, SD = .15$).

Effects of intervention and child risk status on child health

An ANCOVA was conducted to test the effects of children’s risk status and the intervention condition on children’s reported health at 3 years of age (see Table 3). The only effect that reached significance was the interaction between child risk and intervention condition, $F(1, 56) = 5.54$, $p = .02$, $\eta^2 = .09$. A planned contrast conducted to test the predicted pattern of effects was significant, $t(59) = 3.21$, $p = .002$. High-risk children in the cognitively enhanced condition showed higher health levels than did low-risk children, whereas the reverse pattern was shown in the traditional condition. A follow-up analysis conducted to determine whether child gender moderated these effects yielded no main or interaction effects of gender.

### Table 2

<table>
<thead>
<tr>
<th>Predicted weights Type of investment</th>
<th>Cognitively enhanced condition</th>
<th>Traditional condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>High risk</td>
<td>Low risk</td>
</tr>
<tr>
<td>Care provision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.59a (.27)</td>
<td>1.02ab (.00)</td>
<td>.88 (.25)</td>
</tr>
<tr>
<td>Fun activities</td>
<td>.47ab (.23)</td>
<td>.70a (.30)</td>
</tr>
<tr>
<td>Clothing purchase</td>
<td>.52ab (.46)</td>
<td>.84a (.54)</td>
</tr>
<tr>
<td>Entertainment funds</td>
<td>.42 (.58)</td>
<td>.58 (.26)</td>
</tr>
<tr>
<td>Food purchase</td>
<td>.32 (.15)</td>
<td>.26 (.10)</td>
</tr>
</tbody>
</table>

Note. Values represent percentages of total investment in particular items. Means (corrected for covariates) in the same row followed by common subscripts are significantly different at less than the .05 level of confidence using LSD tests for predicted differences.
Two analyses were conducted to test the predicted role of parental investment as a mediator of the observed relationship between predictor variables (the interaction between parental investment and child risk) and children’s reported health. In addition to the covariates included in original analyses, the main effect of condition and the main effect of child risk were introduced as covariates. We employed Preacher and Hayes’s (2008) bootstrapping procedure to obtain estimates of the significance of indirect effects. This method allowed us to measure the effects of more than one mediating variable (e.g., different types of investment). As a second advantage, Preacher and Hayes’s method is sensitive to effects found in small samples. In addition, significant mediation can be measured in the absence of a significant direct relationship between independent and dependent variables. It has been pointed out that under some circumstances the test of the mediated effect has greater statistical power than the test of the direct effect (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

The first analysis provided a test of the mediating role of (a) parental investment of time in care provision and (b) parental investment of time in shared fun activities in the observed interaction between condition and child risk and children’s health. The interaction between condition and child risk served as a significant predictor of the time invested by parents in the provision of care for the target child ($B = -0.52$, $p < .001$) as well as shared fun activities ($B = -0.40$, $p = .004$). Parental time investment in care provision (but not parents’ time spent in shared fun activities) was significantly related to children’s reported health at 3 years of age ($B = 2.89$, $p = .036$). The greater the investment of time in care provision, the fewer the health problems reported (see Fig. 2). As would be expected (in support of mediation), the relationship between the predictor variable and child health was no longer significant when parental time investment was entered into the analysis. Employing the bootstrapping syntax for SPSS (Preacher & Hayes, 2008), the predicted indirect effect of parental investment of time in care provision (controlling for covariates) was found to be significantly different from zero ($p < .05$) and, thus,

### Table 3

<table>
<thead>
<tr>
<th></th>
<th>Cognitively enhanced condition</th>
<th>Traditional condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low risk</td>
<td>High risk</td>
</tr>
<tr>
<td>Predicted weights</td>
<td>1</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>1.95 (3.04)</td>
<td>$0.54_{(0.65)}$</td>
</tr>
</tbody>
</table>

*Note. Values represent total numbers of reported health problems for the previous 3 months. Means (corrected for covariates) followed by common subscripts are significantly different at less than the .05 level of confidence using LSD tests for predicted differences.*

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**Fig. 2.** Mediation effects of parental investment on the relationship between predictor variables (the interaction between intervention condition and child preterm status) and child health. Coefficients are unstandardized betas. *$p < .05$; **$p < .01$.**
can be seen to be statistically reliable in its role as a mediator of the relationship between intervention condition and children’s health at 3 years of age.

A second analysis was conducted to test the mediating role of financial investment (clothes and/or entertainment) in the relationship between predictor variables and child health. Tests of mediation did not reach or approach significance. Thus, the meditational role of parental investment appears to be limited to time spent in provision of care rather than time spent with children on other activities or in financial expenditures.

**Discussion**

Consistent with predictions, mothers in the cognitively enhanced home visitation condition showed greater investment of both time and money in high-risk children than in low-risk children. In contrast, mothers in the traditional condition showed greater investment of time and money in low-risk children than in high-risk children. Reflecting this disproportional investment, at-risk children in the traditional home visitation condition showed poorer health than did lower risk children. In the cognitively enhanced home visitation condition, high-risk children showed health levels equivalent to those shown by low-risk children. These results show evidence for the contingency model of parental investment (proposed by Bugental & Beaulieu, 2003). An intervention that led to increases in mothers’ caregiving skills (a nonmaterial resource) also predicted increases in the amount of time those mothers spent providing care for their high-risk children, with ultimate benefits for the children’s health.

These results suggest that when mothers participate in an early intervention designed to increase caregiving skills (a central resource in parenting relationships), the health of high-risk infants will increase. The observed pattern is consistent with a mechanism that involves computation of both risk and available resources in the environment, followed by implementation of a parenting strategy based on that computation. It implies that mothers have the ability—when their cognitive resources are increased—to regulate their investment practices in ways that increase the future health outcomes of their high-risk children.

These findings suggest that parental investment strategies follow an “if–then” pattern. If a mother’s resources are increased, then she can more easily invest in a high-risk child. This stands in contrast to outcomes that follow the traditional home visitation condition. In this situation, mothers are more likely to follow the “reproductively safe” strategy of preferential investment in low-risk children.

These observations support previous suggestions within this literature. For example, they support the investment strategies found by Davis and Todd (1999) to be most adaptive within a simulation study. They mirror the anecdotal evidence found among nonhumans. They also replicate and extend previous findings of Bugental and Beaulieu (2003) within a different sample of families that also received the intervention described here. These investigators found that parents in the cognitively enhanced condition were likely to make efforts to seek additional information about their high-risk children, whereas parents in the traditional condition were more likely to make efforts to seek additional information about their low-risk children.

The findings reported here also support previous findings concerned with the investment patterns of depressed versus nondepressed parents (Beaulieu & Bugental, 2008). Parents were asked to divide scarce resources between themselves and their children. Depressed parents (who may be thought of as having low attentional or emotional resources) were more likely to provide preferential benefits for low-risk children. In contrast, nondepressed parents were more likely to provide preferential benefits for high-risk children.

**Limitations**

Future research is needed to determine the investment patterns shown with different types of families. The population studied here was constrained in both the time and money that parents could invest in their children. In a wealthier population, parents are more likely to have discretionary time (due to purchases of child care) and/or discretionary money.
The modest sample size also serves as a limitation of this study. In addition, the dropout rate was relatively high and typically involved families who had left the area or moved without leaving forwarding addresses. As a result, inferences that can be drawn from our findings may be limited to less mobile families.

As another limitation, our health data relied on parental reports. It would be useful in future research to (a) provide objective data on children’s health and (b) determine the long-term health outcomes of at-risk children as a result of their early parental investment history.

Implications

On an applied level, these findings suggest the value of an early intervention program that fosters an increase in parents’ nonmaterial problem-solving resources. As mothers increased in their ability to manage the caregiving environment, the future health benefits of their children were enhanced 2 years after the conclusion of the program.

As an anecdotal example of this process, one mother in the cognitively enhanced condition (who was a poorly educated field-worker) came to view not only the provision of care for her child but also her own future outcomes as malleable. Consistent with this emerging view, she took action that increased her resource-holding potential. She went to night school (after her days in the field), first learned to speak English, and then acquired training as a medical assistant. She ultimately did obtain a position as a medical assistant and, as a single parent, improved the outcomes of both herself and her child. Acquisition of skills and motives for effectively managing the present and preparing for the future represents an invaluable “resource” for parents.

At a more basic level, this research reflects the complementary nature of theoretical perspectives. Parent–child relationships have historically been viewed from a social learning perspective. However, increasing evidence (as reviewed by Bugental & Grusec, 2006) is emerging to show the value of also considering the role of evolutionary processes in the mechanisms that operate within parent–child relationships. What we hope to have demonstrated here is that interventions introduced to improve early parent–child relationships benefit when consideration is given to some of the underlying computational and strategic processes that operate within such systems. Humans have evolved with a suite of mechanisms to handle the different circumstances involved in the care of the young. Such interactions are contingent in nature; that is, different mechanisms are accessed in response to different environments. When the usual course of parenting is interrupted in an at-risk family—in this case by an intervention that facilitated the resource-holding potential of parents—alternative investment strategies become accessible. As parents’ resource-holding potential is increased, they show increased willingness to invest in high-risk children. This results not only in individual reproductive “pay-off” but also in public health benefits in terms of reducing the long-term costs that often follow an early history of perinatal problems.

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