
AN EDUCATIONAL INTERVENTION IMPROVES DEVELOPMENTAL PROGRESS OF YOUNG CHILDREN IN A ROMANIAN ORPHANAGE

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ABSTRACT: From 1991 to 1994, a group of Romanian and American colleagues undertook an experimental and humanitarian effort to try to improve the quality of life, mental health, and developmental progress of young children in a Romanian orphanage. In the context of institutional care, we experimentally introduced stable adult–child relationships, small group size, and a protocol of enriched caregiving and educational activities. These procedures were adapted from an intervention in childcare centers in the United States that had been proven effective in reducing intellectual decline in at-risk children. Developmental scores for orphanage children were derived from the Denver II (a revision of the Denver Developmental Screening Test; Frankenburg & Dodds, 1990), which was translated into Romanian and administered as a pre- and posttest to the experimental subjects and comparison groups in the same institution. Mixed models combining both within- and between-subject heterogeneous variance-covariance structures were utilized to analyze the impacts of time, intervention/control group assignment, child sex, child age, and interaction of Group \times Time on the developmental scores. For the developmental outcome variables, the effects of group assignment (experimental vs. comparison) were highly significant. There also was a Group \times Time interaction effect. We conclude that an educational intervention which includes the addition of resources and training can be initiated and sustained in an orphanage for young children as a way of improving institutional care.

RESUMEN: De 1991 a 1994, un grupo de colegas rumanos y norteamericanos se dedicó a un esfuerzo experimental y humanitario para tratar de mejorar la calidad de vida, la salud mental y el progreso en el

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desarrollo de niños en un orfanato en Rumania. Dentro del contexto del cuidado institucional, experimentalmente introdujimos estables relaciones entre los niños y los adultos, grupos de tamaños pequeños, así como un protocolo con el fin de enriquecer las actividades educativas y del cuidado. Estos procedimientos fueron adaptados de una intervención en centros de cuidado infantil en los Estados Unidos, los cuales habían demostrado efectividad en reducir la reducción en la intelectualidad en niños bajo riesgo. Los puntajes en cuanto al desarrollo de niños en orfanatos se derivaron del Denver II (una revisión del Examen Denver para la Protección del Desarrollo), el cual fue traducido al rumano y las personas involucradas en el experimento lo tomaron como un examen preliminar y posterior. También lo tomaron grupos de comparación en la misma institución. Con el fin de analizar el impacto del tiempo, de las asignaciones de grupos de control e intervención, del sexo del niño, de la edad, y de la interacción de grupo "x" en cuanto a los puntajes del desarrollo, se utilizó una mezcla de modelos, los cuales combinaban estructuras heterogéneas de discordia y co-discordia, tanto dentro como entre los individuos. Para las variables de los resultados en cuanto al desarrollo, los efectos de la asignación de grupo (grupo experimental vs. grupo de comparación) fueron altamente significativos. Se dio también un grupo "x" que contribuye a la interacción en el tiempo. Concluimos con que una intervención educativa que incluya recursos adicionales y entrenamiento puede ser iniciada y sostenida en un orfanato para niños como una manera de mejorar el cuidado que se presta institucionalmente.

RÉSUMÉ: De 1991 à 1994 un groupe de collègues roumains et américains entreprit un effort expérimental et humanitaire afin d'essayer d'améliorer la qualité de vie, la santé mentale et les progrès en matière de développement de jeunes enfants dans un orphelinat roumain. Dans le contexte de soin institutionnel, nous avons introduit de façon expérimentale des relations stables enfant-adulte, des groupes de petite taille, et un protocole de mode de soin enrichi et d'activités éducationnelles. Ces procédures ont été adaptées d'une intervention dans des crèches aux Etats-Unis qui s'était avérée efficace pour la réduction du déclin intellectuel chez les enfants à risque. Les scores de développement pour les enfants de l'orphelinat ont été dérivés de Denver II (une révision du Test de Dépistage Développementale de Denver) qui fut traduit en Roumain et administré comme pré-test et post-test aux sujets de l'expérience et aux groupes de comparaison dans la même institution. Les modèles mixtes combinant des structures hétérogènes de variance-covariance à la fois chez le sujet et entre sujets ont été utilisés pour analyser les impacts du temps, de l'affectation intervention/groupe de contrôle, du sexe de l'enfant, de l'âge de l'enfant, et de l'interaction du temps groupe x sur les scores de développement. Pour les variables de résultat développemental, les effets de l'affectation du groupe (expérimental vs. comparaison) étaient très importants. On a aussi décelé un effet d'interaction du temps groupe x. Nous concluons qu'une intervention éducationnelle qui inclue l'adjonction de ressources et de formation peut être mise en oeuvre dans un orphelinat pour de jeunes enfants en tant que manière d'améliorer le soin institutionnel.

ZUSAMMENFASSUNG: Zwischen 1991 und 1994 unternahmen eine Gruppe rumänischer und amerikanischer Kollegen eine experimentelle und humanitäre Anstrengung indem sie versuchten die Lebensqualität, die seelische Gesundheit und die Entwicklungsgeschwindigkeit der jungen Kinder in einem rumänischen Waisenhaus zu verbessern. Im Umfeld der institutionellen Betreuung haben wir experimentell stabile Erwachsenen-Kind Beziehungen, kleine Gruppengrößen, eine Anleitung für verbesserte Betreuung und Lernaktivitäten eingeführt. Diese Maßnahmen wurden von einer Intervention in Kinderbetreuungscentren in den USA ubesommen in denen sie sich bei der Bekämpfung des Nachlassens des Intellekts bei Risikokindern effektiv gezeigt hatten. Die Entwicklungsdaten wurden mittels Denver II (einer Überarbeitung des Denver Entwicklungstests) erhoben, der ins Rumänische übersetzt und als Vor- und Nachuntersuchung bei den Untersuchungspersonen und der Vergleichsgruppe in derselben Institution angewandt wurde. Verschiedene Modelle, die sowohl im Einzelnen, als auch zwischen Personen heterogene Varianz - Kovarianz Strukturen testeten, wurden angewandt, um den Einfluss der Zeit, Zuordnung zu Interventions- oder Kontrollgruppe, Geschlecht, Alter und die Interaktion zwischen Gruppe x Zeit bei den Entwicklungsparametern zu analysieren. Für die Entwicklungsparameter war der Vergleich zwischen Interventions- und Kontrollgruppe hoch signifikant. Es gab auch einen Gruppe x Zeit Effekt. Wir schließen daraus, dass eine erzieherische Intervention, die einen Zuwachs an Mitteln und Fortbildung

beinhaltet, in einem Waisenhaus für kleine Kinder als einen Weg institutionelle Pflege zu verbessern initiiert und erhalten werden kann.

抄録：1991年から1994年にかけて、ルーマニアとアメリカの同僚のグループは、ルーマニアの児童養護施設にいる幼い子ども達の生活の質、精神保健、そして発達の進歩を向上させようと試みる、実験的で人道主義的な努力を行った。施設でのケアのコンテキストの中で、われわれは、安定した大人と子どもの関係性、小さな集団サイズ、そして強化された養育と教育の手順を、実験的に導入した。これらの手続きは、アメリカ合衆国のチャイルドケア・センターでの介入から適応された。その介入は、危険な状態にある子ども達の知的な減退を軽減する上で、効果が証明されていた。児童養護施設の子どもの発達スコアは、Denver II (Denver 発達スクリーニングテストの改訂版)によって得られた。それはルーマニア語に訳され、介入前と後のテストとして、同じ施設の実験群と対照群に実施された。時間、介入群／対照群の割り付け、子どもの性別、子どもの年齢、そして発達スコアへの群×時間の相互作用の影響を分析するために、標本内および標本間両者の不均一な分散共分散構造を組み合わせた混合モデルが使われた。発達の結果の変数に関しては、グループの割り付け（実験群対対照群）が高度に有意だった。グループ×時間の相互作用の影響もあった。われわれは、資源の追加と訓練を含む教育的介入が、施設でのケアを改善するための方法として、幼い子どものための児童養護施設に導入され、維持される事ができると、結論付ける。

* * *

The understaffed and underfunded institutional conditions that affected many thousands of infants and children in Romanian orphanages in the early 1990s were not limited to Romania, but tragically, then and now, represent a significant portion of institutional care worldwide. Previous research has documented the potentially devastating effects of inadequate institutional care, particularly when it is prolonged (Bowlby, 1965; Dennis, 1973; Landesman, 1990). What has been less well established is (a) the extent to which improvement of institutional life can be made via systematic training of staff and the addition of resources and (b) whether this investment will significantly improve child social-emotional and cognitive outcomes. These are important issues because adoption has traditionally moved children out of orphanages at a slow rate and because many children are spending lengthy periods of their young lives in institutional care.

RESEARCH DESIGN

This prospective intervention trial was comprised of two sequential studies. Study 1 (conducted in 1991–1992) was of quasiexperimental design with nonrandom experimental and control groups, and Study 2 (conducted in 1993–1994) was of experimental design with randomized groups. The same treatment was introduced to the experimental groups in the two studies, each of which lasted about 1 year (Study 1 = 13 months, Study 2 = 12 months). To measure outcome, psychologists from a neighboring orphanage administered developmental evaluations as pre- and posttests in both studies and additionally at approximately the midpoint of Study 1. Additional aspects of the research strategy included the collection of process data, videotaped

staff–child interactions, and the review of extreme cases of child response and nonresponse to the intervention.

SUBJECTS

Participants in our studies resided in Leagan de Copii, Nr. 1, Iasi—an orphanage in Iasi, Romania for children from birth to 3 years of age (The institution was closed as of October 2003 and children placed in foster care homes.) The 104 children in Study 1 ranged from 6 to 25 months of age at the time of the pretest, with an average of approximately 15 months of age. In Study 2, we wanted to start with younger children, and thus the average beginning age for the 65 children in that study was about 6 months, with the youngest a little less than 2 months of age and the oldest 10 months of age (see Table 1). In the second study, we randomized the children as a way of equitably distributing the scarce resources of intervention and to improve the research.

In Study 1, children in the experimental group entered the orphanage (see Table 1, Placement Age) slightly earlier ($p < .02$) than those in the control group, producing longer orphanage stays ($p < .02$) for the experimental group. The average birth weight of groups was similar, with slightly lighter weight ($p < .05$) in the experimental group of Study 1. Note that longer stays in the orphanage and lighter birth weight would typically predict a developmental disadvantage for the experimental group. There were more boys than girls in both studies. No children participating in these studies were prevented from receiving other forms of treatment or from being reunited with their families or placed with adoptive families.

INTERVENTION METHOD

The treatment, or method of intervening, was derived from earlier interventions that had been demonstrated to be effective in reducing intellectual decline in at-risk children (Infant Health and Development Program, 1990; Ramey et al., 1992; Ramey & Campbell, 1992). Thus, a notable feature of the present studies was the retooling of a proven intervention to fit a new and radically different setting. The intervention procedures (Sparling et al., 1991) were originally designed for use in childcare centers and in home-visiting programs in the United States, but were completely redesigned and adapted to a Romanian institutional setting. The adapted

TABLE 1. *Characteristics of the Children in the Studies*

	<i>Study 1</i>				<i>Study 2</i>			
	<i>Experimental Group</i>		<i>Control Group</i>		<i>Experimental Group</i>		<i>Control Group</i>	
	M	(SD)	M	(SD)	M	(SD)	M	(SD)
Age at Prettest (in months)	15.2	(5.0)	15.9	(6.0)	6.5	(2.3)	6.6	(2.2)
Placement Age (in months)	2.3	(3.3)	5.4*	(5.9)	1.8	(1.6)	2.8	(4.3)
Length of Stay Prior to Prettest (in months)	13.3	(5.8)	10.6*	(6.4)	4.7	(2.6)	3.5	(4.5)
Birth weight (g)	2,800	(600)	3,000**	(500)	2,800	(600)	2,800	(600)
Sex: Males	<i>n</i> = 48		<i>n</i> = 15		<i>n</i> = 20		<i>n</i> = 17	
Females	<i>n</i> = 28		<i>n</i> = 13		<i>n</i> = 15		<i>n</i> = 13	

* $p < .02$. ** $p < .05$.

intervention was more than a set of guiding principles. It included a coordinated set of activities: (a) staff training, (b) caregiving/intervention protocol, (c) educational games, and (d) supervision—all designed to improve the children's quality of life and their quantity and quality of educational stimulation.

Permanent staff of the Leagan, including physicians, nurses, educators, and infirmiere (custodial caregivers), related to and supported the program; however, to staff the core experimental manipulation, recent graduates of technical high schools were hired and trained as daily caregivers in the experimental groups of both studies. With these new workers, a caregiver-to-child ratio of 1:4 was maintained from 6 a.m. to about 1 p.m., 5 days per week. Each group of 4 children had their own small play/sleeping room and continued their daily relationship with the same caregiver for 12 months, except in the rare instances when there was unavoidable staff turnover or transfer. It is significant to note that the prior pattern in this and many other orphanages (a pattern that continued in the control groups during these studies) consisted of small numbers of staff to many children and constantly rotating staff assignments that prevented stable caregiver–child relationships. We felt that this rotating pattern of care strongly mitigated against the optimal development of child mental health and cognitive functioning.

Caregivers who staffed the experimental groups of both studies received 1 week of training prior to employment and continued to receive periodic training and frequent supervisory feedback regarding their work. The caregivers followed an intervention protocol of three basic parts. (a) They provided *ingrijiri imbogatite* (enriched caregiving) by adding educational stimulation such as making eye contact, pointing to objects, and naming things the child sees during bathing, dressing, feeding, and other daily care procedures; (b) they engaged all children in *intimplari cu invatari* (common events with educational value) such as reading a book, going for a walk, or reciprocal verbal play; and (c) they implemented *Invatin Impreuna (Learning Together)*, an individualized curriculum of educational games and interactions described in a set of 75 curriculum cards. These cards were a Romanian language translation (see Figure 1) of key parts of the *Partners for Learning* curriculum (Sparling, Lewis, & Ramey, 1995).

MEASURES

Process

Activities in the three main areas of the intervention protocol were tallied daily by the caregivers on each child's *Fisa de Educatie* (Educational Record), which was posted on the wall of the child's room. The data from the Educational Record and from other staff records were summarized into a number of process variables, six of which will be reported in this article. As another process measure, we collected videotaped adult–child interactions for a random subsample of age-matched children in the experimental and control groups of Study 1. After about 3 months of intervention, a random sample of 15 children was drawn from the control group, and for each the nearest-age, same-sex child was identified in the experimental group. The resulting 30 children were videotaped in their daily activities. Age differences in paired children averaged 7.23 days.

Outcome

A Romanian translation of the Denver II test (Frankenburg & Dodds, 1990), a developmental screening instrument normed in the United States and a number of other countries but regrettably not in Romania, was administered before and after the intervention period in both studies

Forme Pentru Aruncat



punctul de plecare: copilul experimentează spontan aruncarea la coș.

obiectivul: copilul înțelege cuvântul "aruncă" și are suficiență precizie în aruncarea unor forme într-un coș (ținut de adult) în proporție de aproximativ 50% din încercări.

FIGURE 1. Sample item from *Invatin Impreuna (Learning Together)*.

and at the midpoint in Study 1. In both studies, the Denver II data were used to compute for each child four developmental scores as outcome variables. Research on the Denver Developmental Screening Test (DDST; Frankenburg & Dodds, 1967), the precursor test to the Denver II, had established the validity of such developmental scores. That research demonstrated that the average of the four developmental scores derived from sections of the DDST was highly correlated with several full-scale intelligence or developmental tests, including the Bayley Scales of Infant Development and the Stanford-Binet Intelligence Scale (Frankenburg, Camp, & Natta, 1971).

ANALYSIS AND RESULTS

Process

Process variables were analyzed for the time period between the pretest and the midpoint of Study 1. The relationships among the process variables and their relationship to gains between the pretest and midpoint Denver II were examined through an intercorrelation matrix. The first three process variables were derived from the Educational Record and represented average weekly frequency counts for how often the caregiver reported engaging a particular child in

enriched caregiving, common events with educational value, and the Learning Together curriculum. Three additional process variables were the average rating of child performance (how well the caregiver felt the child achieved the goals of games in the educational curriculum), child illness (number of days the caregiver considered the child to be sick), and rating of caregiver performance (the supervisor’s evaluation of the caregiver’s work with the children).

These six process variables were chosen for joint analysis because they either reflected the implementation of the intervention program or might have had an impact on it. They were included in the Table 2 intercorrelation matrix along with the Denver II outcome measure, an average in the gain in four developmental areas.

The intercorrelation matrix showed that the first four process variables (see the first three columns of Table 2) had meaningful and expected relationships to each other. Some of these interrelated process variables (specifically, the caregiver’s rating of child performance and common events with educational value) were correlated with the outcome measure, Denver II gains. While a causal chain of relationships cannot be claimed, the intercorrelations fit the hypothesis that caregivers give more of the program to children whom they rate more highly and who, in turn, make greater developmental gains on the Denver II. The child illness variable, as expected, was weakly or negatively related to other variables, especially to Denver II gains. The supervisor’s rating of caregiver performance was moderately related to two items in the first tight cluster of process variables.

The videotapes of adult–child interaction were coded, and duration measures for two variables were accumulated for the first 20 min of each tape. The first variable, adult talk, represented instances on the tape in which the adult talked directly to the target child; the second variable, adult talk & touch, referred to instances when the adult both talked to and touched the child. Mean values were compared between the experimental and control groups. We assume that the values for both groups were inflated since the caregivers knew they were being videotaped; still, the comparison is instructive.

Since a part of the training for the caregivers emphasized talking to the child and naming objects while pointing to or touching them, we felt that the adult talk & touch variable might be particularly important in stimulating the child’s development and would be typical of the

TABLE 2. Intercorrelations Among Process Variables and Their Relationship to Program Outcome

<i>Process</i>	<i>Process</i>					<i>Outcome</i>
	<i>Common Events with Educational Value</i>	<i>Learning Together Curriculum</i>	<i>Rating of Child Performance</i>	<i>Child Illness</i>	<i>Rating of Caregiver Performance</i>	<i>Denver II Gains</i>
Enriched Caregiving	.52***	.41**	.39**	.00	.09	.18
Common Events with Educational Value		.82***	.66***	-.10	.31*	.44**
Learning Together Curriculum			.53***	-.05	.29*	.08
Rating of Child Performance				.05	.19	.70**
Child Illness					-.01	-.20
Rating of Caregiver Performance						.15

* $p < .01$. ** $p < .001$. *** $p < .0001$.

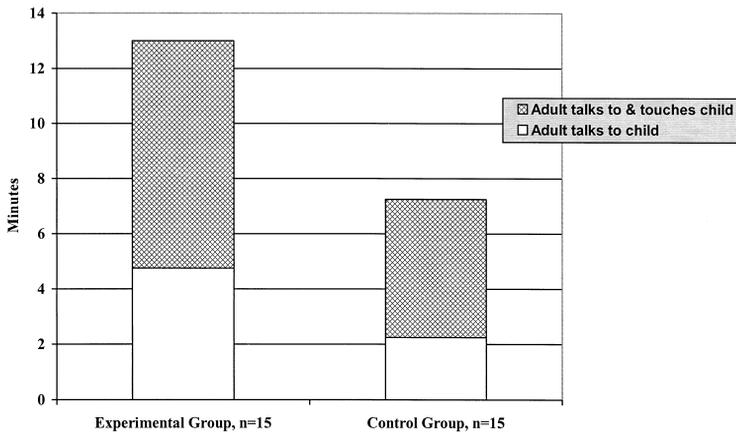


FIGURE 2. Duration of two types of adult talk in videotaped adult-child sessions, Study 1.

caregivers' behavior in the experimental group. In fact, Figure 2 showed that there were differences between groups on both variables, but the difference was greater for the simpler variable, adult talk. In the 20-min sessions, adult talk for the control versus experimental groups averaged 2.27 versus 4.83 min ($p < .002$) while adult talk & touch averaged 4.93 versus 8.20 min ($p < .04$). Both of these differences were substantial, but the adult talk variable was intriguing in that it correlated ($r = .71, p < .0001$) with the gain in Denver II developmental gain scores for the 30 videotaped children. Since the video variables came first in time and the Denver II gains came second, these process data fit the hypothesis (although they do not offer conclusive proof) that it is the behavior of the caregivers that carries the intervention to the children and affects their developmental outcome.

Outcome

Developmental scores as outcome variables were analyzed through a mixed models procedure combining both within- and between-subject heterogeneous variance-covariance structures. We tested the impacts of time, group (experimental vs. control group assignment), sex, child placement age (the age at which the child entered the institution), and the Group \times Time interaction on the outcome variables. The outcome variables were developmental scores from the Denver II in four areas defined by the test: personal-social, fine motor-adaptive, language, and gross motor. The compound symmetry matrix was selected for the within-subject covariance matrix, and the model allowed different between-subject variance-covariance structures for each group. The Group \times Sex interaction was originally considered in the model, but was excluded since it was totally insignificant in the model.

The mean developmental scores of the experimental and control groups at the three testing occasions for Study 1 were plotted in Figures 3 to 6, and significance testing was reported for these figures in Table 3. Each of the four figures shows results in one of the Denver II developmental areas.

Even though the groups in Study 1 were nonrandom, the figures visibly confirmed that the experimental and control groups started at almost identical levels in the four developmental areas. As can be seen in the figures and in the significance table, there was a clear effect of time on all four developmental outcome variables (i.e., children in general, regardless of group assignment, progressed as time went by). But when group and the Group \times Time interaction were viewed as variables, there were strong significant effects on three of the developmental

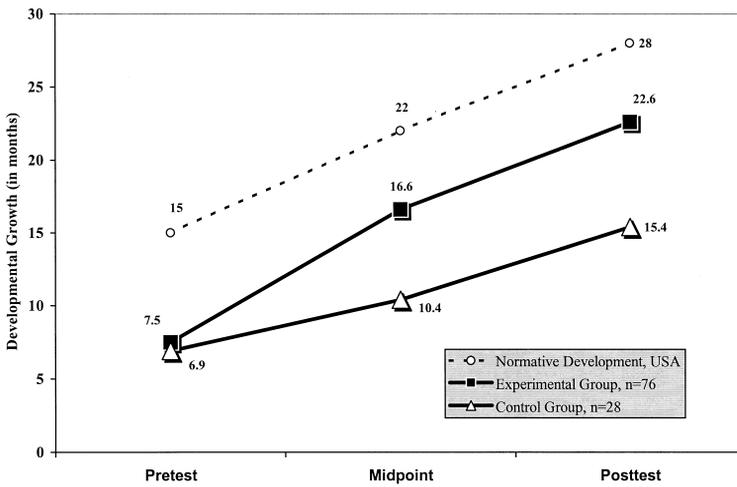


FIGURE 3. Personal-social development, Study 1.

outcome variables. Specifically, personal-social, fine motor-adaptive, and language development differed in mean value and progressed at different rates for the experimental and control groups. In Figures 3, 4, and 5, the developmental trajectories visibly diverged by the midpoint of the study. The developmental lines showed only minimal separation for the fourth outcome variable, gross motor, and Table 3 revealed that this small visible separation represented a difference in rate of change (Group × Time) but not a statistically significant difference in mean values for group.

Further significance testing in the mixed model of the four developmental outcomes in Study 1 revealed no differences based on sex; however, as expected, a strong effect for age (i.e., older children scored higher than younger children) was found for three of the outcome variables. The fact that the effect was weaker ($p = .028$) for language means that older children in the groups performed only slightly better than the younger children. This is a likely effect of longer stays in the orphanage environment for the older children.

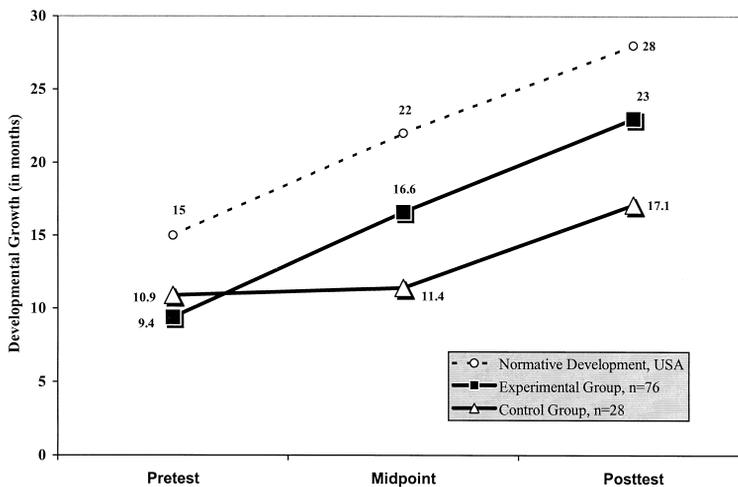


FIGURE 4. Fine motor-adaptive, Study 1.

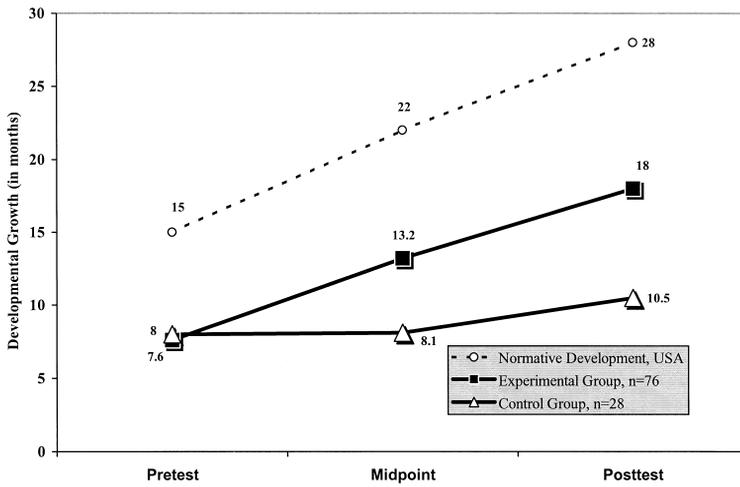


FIGURE 5. Language development, Study 1.

As a point of reference, Figures 3 to 6 also included a developmental function from the norms on which the Denver II instrument was based. While these norms from the United States were not an ideal basis for comparison for Romanian children, they did provide a way of looking beyond the two groups included in the study design. If Romanian norms had been available, the following results might have been somewhat different in amount, but they would have almost surely been in the same general direction. Comparing the slopes of the plotted group lines against the normative lines, it was evident that in the personal-social and fine motor-adaptive areas, the experimental group was changing as fast or a little faster than developmental expectation and thus not losing ground relative to the test norms. In personal-social development, the experimental group was behind by almost 8 months at the pretest and by less than this, about 5 months, at the midpoint and posttest; in fine motor-adaptive, they were behind by about 5 months at all testing occasions. In all other instances, both groups were losing ground during the year-long study. Relative to the test norms, the experimental group lost ground

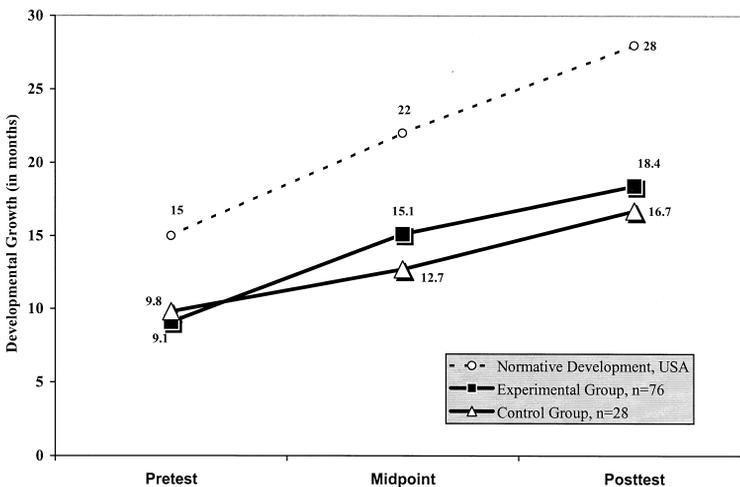


FIGURE 6. Gross motor development, Study 1.

TABLE 3. *Mixed Model of Study 1*

<i>Effects</i>	<i>Outcomes</i>			
	<i>Personal-Social</i>	<i>Fine Motor-Adaptive</i>	<i>Language</i>	<i>Gross Motor</i>
Time	<0.001	<0.001	<0.001	<0.001
Group	<0.001	0.005	<0.001	0.177
Sex	0.129	0.171	0.154	0.689
Age	0.002	<0.001	0.028	<0.001
Group × Time	<0.001	<0.001	<0.001	0.014

Note. Cells contain *p* values.

gradually in language and gross motor; however, the greatest losses occurred in the first half of the study for the control group in language and fine motor-adaptive development. In both areas, the almost flat line of the control group indicates little perceptible change in developmental status; therefore, with the passage of time they lost ground at a dramatic rate.

Since Study 1 had already examined the “pattern” of development during the course of intervention, the design of the second study was simplified by the removal of the middle measurement point. Without this midpoint, the results of Study 2 were reported more economically in Figure 7 as a bar graph. The height of the bars represented the number of months of developmental growth that occurred during the intervention period that lasted about 12 calendar months. Significance testing was reported in Table 4. This second study sought to replicate with younger children the findings of the first study.

The results of the Study 2 mixed model followed the Study 1 results on most points, but some significance levels were not quite as high. As in Study 1, initial developmental scores were almost identical for the experimental and control groups. As before, the effect of time on all four developmental outcome variables was highly significant. The effects of group and Group × Time, the mean values and the rate of change, were again significant; however, now all four developmental areas, including gross motor, differed between the experimental and

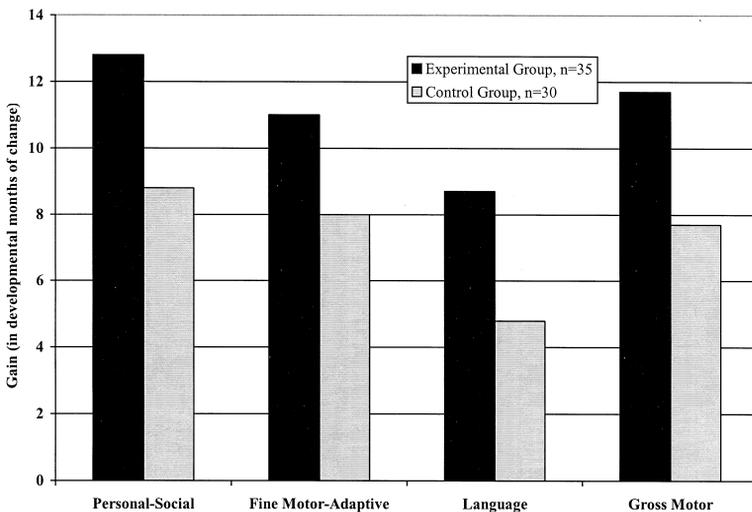


FIGURE 7. Denver II developmental gains, Study 2.

TABLE 4. *Mixed Model of Study 2*

<i>Effects</i>	<i>Outcomes</i>			
	<i>Personal-Social</i>	<i>Fine Motor-Adaptive</i>	<i>Language</i>	<i>Gross Motor</i>
Time	<0.001	<0.001	<0.001	<0.001
Group	0.011	0.010	<0.001	0.015
Sex	0.500	0.964	0.737	0.214
Age	0.024	<0.001	0.043	<0.001
Group × Time	0.006	0.010	<0.001	<0.001

Note. Cells contain *p* values.

control groups. Since there was no midpoint measurement in Study 2, we did not learn how soon this rate of change was manifested—only that it was evident by the end of the study.

As in the earlier study, no significant developmental differences were associated with sex. The Study 2 effect for age was strong for fine motor-adaptive and gross motor development. In Study 1, the effect for age had been significant but weak for language. Now it was significant but weak for both language and personal-social development, meaning that older children were performing in these areas only slightly better than younger children.

No normative reference was included in Figure 7, but since the elapsed calendar time period for Study 2 was about 1 year, we would have expected 12 months of developmental progress during the study. This would be true because the Denver II was normed so that 1 month of calendar time would equal 1 month of developmental progress. The experimental group achieved just over or just under the expected rate of growth in three areas: personal-social, fine motor-adaptive, and gross motor. But in these three areas, in the same 12 months of elapsed time, the control group achieved only about 8 months of developmental growth. Language was the only area with a substantial shortfall in development by both groups. Here, the experimental group developed at the rate the control group established in the first three areas (8 months of development in 12 months of elapsed time), and the control group progressed only half as rapidly as the experimental group.

Another way of looking at the previous results is as a set of absolute differences between scores of the groups in Study 2 and normative scores. Both groups were approximately 3 months behind the norms on all developmental variables at the pretest occasion. At posttest, the experimental group was still between 3 and 4 months behind while the control group had dropped to about 7 months behind the Denver II norms. The only exception to this pattern was in language development, where at posttest the experimental and control groups lagged behind norms a little more than 6 months and 10 months, respectively. Since we started the Study 2 intervention at an earlier age, the delays in Study 2 were smaller in terms of months than were the delays observed in Study 1. This finding supports the rationale for earlier intervention.

Case Studies

We decided to look at extreme cases in our experimental group because we knew from earlier studies that all children do not respond equally to intervention. Without using statistical procedures, we examined eight extreme cases within the experimental group of Study 1: the 4 children whose developmental scores changed the least and the 4 whose scores changed the most during the first half of the intervention period. Demographic characteristics and qualitative descriptions from staff notes were reviewed along with test data.

Noticeably different in the profiles of the two clusters of children was the fact that, even though they were about the same chronological age, one cluster was developmentally further behind at the beginning of the intervention. Pretest measures showed that both groups were behind test norms, but the low-change cluster of children had at least a 6-month greater lag in development than the high-change cluster. And, starting from further behind, the low-change children made almost no advance (a total of less than half a month) during the slightly more than half a year of intervention that occurred between the pretest and midpoint administrations of the Denver II. During this 6-month period, the high-change children gained about 2 developmental months for each elapsed month of intervention, yielding a total gain of slightly over 12 developmental months.

Health and physical growth also differentiated the two clusters of children. Of the low-change children, 2 were identified as HIV positive, and each of these had more than 40 days of illness during the intervention months. The other 2 low-change children were very small for their ages (e.g., at 24 months of age, 1 child had the weight of a typical 5-month-old) and gained the equivalent of only 1 to 3 months of physical growth during the half-year intervention period.

Of the high-change children, 2 had late admissions to the orphanage, resulting in a shorter total stay in the institutional setting. In addition, all 4 had stable caregivers with whom minimal or no turnover or reassignment occurred, and 2 of the children were described as “favorites” of the staff. These extreme cases provided documentation for the common-sense assumption that children can respond more fully to positive and stable environmental care when they have not fallen too far behind and do not have devastating health conditions or extreme physical growth delays.

Note that a number of children with disabilities and special health conditions were included in the experimental and control groups of our studies. The 2 HIV+ children mentioned earlier were just 2 of 8 children with special conditions in the Study 1 experimental group. Other conditions in the group included hydrocephaly and congenital limb reduction. By contrast, in the control group, only 1 child had a condition (HIV+) of similar seriousness. These different frequencies occurred because the groups were nonrandom, and all children residing in a particular wing of the orphanage were accepted into the experimental group. Still, even with fewer special children in the control group, significant differences in mean group developmental progress favored the treated group.

CONCLUSIONS AND DISCUSSION

A number of useful lessons were learned and conclusions reached by the colleagues who undertook the two studies reported here. Some of these conclusions were extensions of principles of intervention that were known in other settings, but had not yet been demonstrated in an institutional setting such as a Romanian orphanage. These Romanian institutions have continued to change since the end of this research, and some are under a new name: Centre de Plasament pentru Copii (Center for the Placement of Children). Some findings and recommendations in our article already may have been implemented in certain units.

1. *The behavior of caregivers is crucial since their behavior carries the intervention to the children.* The video data revealed clear intervention–control group differences in language behaviors of the caregiving staff. This is particularly important because these and other similar behaviors of the adult are the hypothesized means by which an intervention reaches the children and affects their mental health and cognitive functioning. We believe that the additional training and supervision of the caregivers and the im-

proved staff–child ratios for the experimental groups were the source of the observed staff behavior differences. Additionally, as a further link in this chain of reasoning, we assume that the experimental group’s improved child-development status was an effect of differences in staff behavior such as frequent and consistent adult–child interaction and frequent playing of educational games.

2. *Any intervention must be well implemented to have an effect on children.* It is common for institutions in all countries to have programs or goals for children, but not to take the necessary steps to verify that the programs have indeed been carried out. Study 1 demonstrated that involving caregiving staff in the keeping of process data is one useful way to insure program implementation and also to estimate and predict children’s developmental gains. In particular, it was noteworthy that the ratings of children by caregivers, who were not trained in any formal assessment techniques, were highly correlated with gains computed from tests given by certified Denver II testers. In other words, caregivers *knew* how well individual children were doing. Institutions should encourage caregivers to keep records and to participate in decisions on how to tailor the program to individual children. If caregivers are involved in keeping program-implementation records and rating the children’s progress, they will be more likely to believe that it really matters whether they actually do the prescribed intervention activities with those in their care.
3. *An intervention can prevent children from progressively falling further behind normal development.* When the rate of developmental progress drops below an average or normal rate, institutionalized children fall further and further behind developmental norms. This is a predictable result of inadequate human resources in an institutional environment. But it is not inevitable—at least not in the short term. In most cases in our studies, children treated with an educational intervention progressed about 1 developmental month per month of treatment while children in the control groups showed rates of development that were one fourth to two thirds this rate. This was true for two of four developmental measures in Study 1 and three of four in Study 2. Treated children in both studies did not progress at normative rate in language, but the control groups were at least twice as slow. We conclude that treated children progressed remarkably well, including early positive response to treatment, but did not demonstrate true “catch-up” (i.e., compensating for earlier developmental delays associated with inadequate environmental resources before the intervention). One obvious recommendation is to start programs of educational intervention earlier so that whole groups of children do not fall behind. Even though we started Study 2 at chronological age 6½ months, children were already about 3 months behind developmental norms. Clearly, starting at birth would be a better strategy.
4. *The positive effects of educational intervention are almost surely underestimated in these studies.* The Denver II was the best instrument available, considering our resources and the training of our testers. Because the Denver II was designed as a screening instrument, not as a test for detecting changes in development, it has widely spaced test items compared to “full-scale” tests. Thus, error in measurement is likely to be in the direction of underestimating rather than overestimating small changes in development. At the beginning of the research, we were not entirely sure that this instrument would be capable of detecting the effects of a 1-year intervention, especially when measured at the midpoint as in Study 1. In reflecting on the superior progress of the experimental group in Study 1, it is useful to recall that this nonrandom group began at a developmental disadvantage due to longer total orphanage stays and a greater proportion of children with serious health problems.

5. *If possible, long stays in the institutional environment should be avoided.* One particular finding reminded us of the danger inherent in longer orphanage stays: The effect of age on language development was weaker than other significant effects in both studies. This weak effect meant that while the older children in general performed better than the younger children, the difference was not as great as one would expect and hope for. This suggests that the younger children in the experimental group were able to benefit from the intervention to a greater degree than the older children. Older children had, as a rule, resided longer in the orphanage environment. We speculate that it is the cumulative effect of longer residency that reduces the response of older children to intervention. As in our earlier recommendation, birth is the only safe time to begin intervention.
6. *Add the resources necessary for intervention.* These two studies demonstrated that an effective intervention can be initiated and sustained in a residential institution for young children. Any institution for children from birth to age 3 considering this type of program will want to obtain resources to:
 - Establish a staff–child ratio of 1:4 for a significant portion of each day.
 - Maintain the 1:4 ratio for 6 to 8 hr a day, 5 days per week (although 7 days per week would make more sense and be considerably better).
 - Keep the caregiver–child assignments constant for as long as possible to allow strong relationships to develop.
 - Provide initial and ongoing training and supervision for the caregiving staff.
 - Provide curriculum resources for staff and children.

The purpose of such an intervention is to maintain a quality of life that supports normative development during a child's orphanage stay, with a goal for the child to be reunited with his or her natural family or placed with an adoptive family as soon as possible.

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