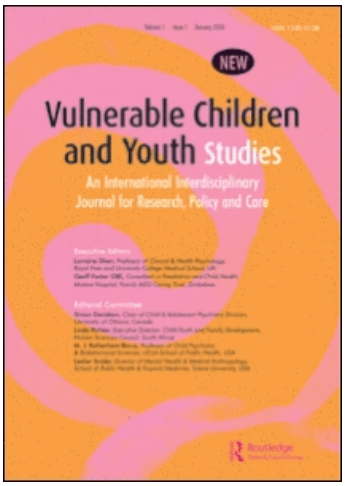

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Debra A. Murphy [a]; William D. Marelich [b]; Hortensia Amaro [c]
[a] Integrated Substance Abuse Programs, Health Risk Reduction Projects, Department of Psychiatry, University of California at Los Angeles, Los Angeles, CA, USA [b] Department of Psychology, California State University, Fullerton, CA, USA [c] Bouve College of Health Sciences, Northeastern University, Boston, MA, USA

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Maternal HIV/AIDS and adolescent depression: A covariance structure analysis of the 'Parents and Children Coping Together' (PACT) Model

Debra A. Murphy[a]*, William D. Marelich[b] and Hortensia Amaro[c]

[a]*Integrated Substance Abuse Programs, Health Risk Reduction Projects, Department of Psychiatry, University of California at Los Angeles, Los Angeles, CA, USA;* [b]*Department of Psychology, California State University, Fullerton, CA, USA;* [c]*Bouve College of Health Sciences, Northeastern University, Boston, MA, USA*

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This study assessed the efficacy of selected variables from the Parents and Children Coping Together (PACT) model, which was designed to predict maternal HIV effects on child/adolescent outcomes. Data from two longitudinal studies applying PACT measures were utilized, encompassing a 7-year assessment time span for HIV-infected mothers and their children. Both maternal and child-based measures were evaluated, and a sequential longitudinal design was adopted. Structural equation modeling using full information maximum likelihood was performed to assess the proposed model. Results show the PACT model was viable in predicting child/adolescent outcomes of self-concept and depression. Study implications are discussed, including the influences of maternal factors on child's self-concept and depression and a reconsideration of the effect of family cohesion on child/adolescent outcomes.

Keywords: Maternal HIV; child self-concept; child depression; structural equation modeling

Introduction

The advent of new antiretroviral medication regimens has shifted HIV from a terminal illness to a chronic disease (Valdiserri, Holtgrave, & West, 1999). Therefore, children are living longer with chronically ill parents who have a highly stigmatized disease. Chronic illness is a major stressor for family members and has been linked to increased psychological distress in adults (Derogatis et al., 1983; Woods, Haberman, & Packard, 1993) and their children (Armistead, Klein, & Forehand, 1995; Worsham, Compas, & Ey, 1997). Only recently have the effects of parental HIV on early and middle age adolescents begun to be examined (Murphy, Marelich, Hoffman, & Schuster, 2006).

Framework for maternal HIV effects on child outcomes

The literature predicts that both parent and child background and situational factors will affect long-term child outcomes (i.e. behavioral adjustment, mental health, and social

*Corresponding author. Email: dmurphy@mednet.ucla.edu

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adjustment) in response to parental illness. A model of maternal HIV effects on child outcomes has been developed for a long-term study of mothers living with HIV/AIDS and their well children (cf. Murphy, Marelich, et al., 2006), the Parents and Children Coping Together (PACT) study. The 5-year PACT study was designed to longitudinally assess mothers living with HIV and their young, well children aged 6–11 years. A subsequent study, Parents and Adolescents Coping Together (PACT II), followed up the majority of these families through child transition to early and middle adolescence. The PACT model (figure 1) was adapted from the works of Sandler, Reynolds, Kliewer, and Ramirez (1992) and Sandler, Tein, and West (1994) describing child and maternal situational and background factors anticipated to affect child adjustment in response to disruptive events (e.g. divorce and parental death). In the PACT model, background and intermediate outcomes of parents and children are anticipated to impact child adjustment and long-term child outcomes. In this study, analysis of a longitudinal model was conducted to determine the relationship between selected background and intermediate factors with child depression (see bolded variables in Figure 1). The support from the literature for each of the variables in the model selected for this study, and their links and hypothesized paths to other variables in the model, will be briefly reviewed.

Maternal and child/adolescent background factors

Ethnicity

Ethnicity is a powerful variable in family responses to HIV, shaping perceptions of illness, health care use, and attitudes toward providers (Chavez, Hubbell, McMullin, Martinez, & Mishra, 1995; Sargent & Brettell, 1996; Clark, 1998). Among HIV-positive adults, ethnicity is a factor in the treatment status, with ethnic minorities, primarily African Americans,

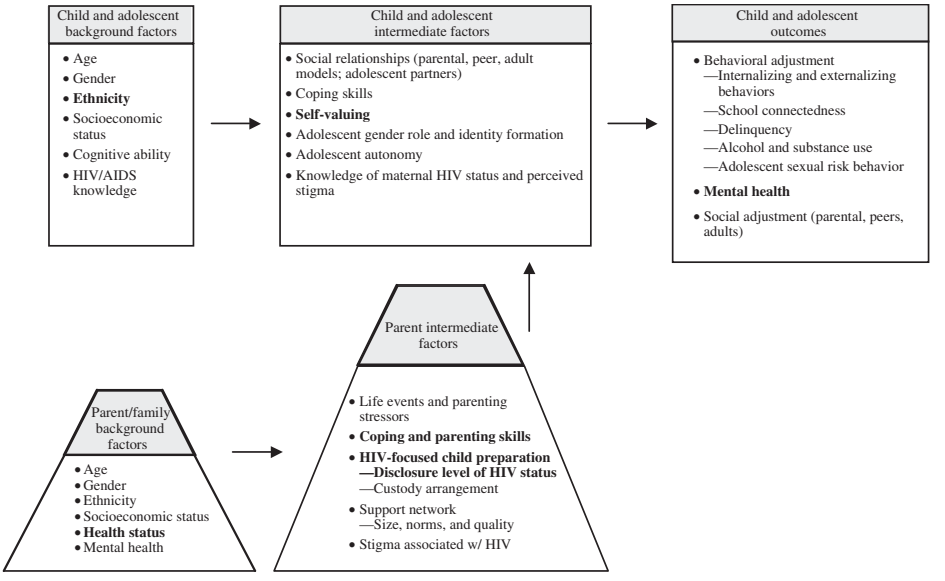

Figure 1. PACT model.
Note: Selected variables for this study are in bold face.

more likely to be untreated (Kalichman, Graham, Luke, & Austin, 2002). Further, rates of disclosure to family and friends are significantly lower for African Americans than for whites (Petrak, Doyle, Smith, Skinner, & Hedge, 2001).

Maternal health

The effects of maternal illness on child outcomes among families affected by HIV have been mixed. Some studies suggest that as illness progresses, mothers with HIV are likely to exhibit a number of maladaptive behaviors that disrupt relationships with their children (Cates, Graham, Boeglin, & Tiekler, 1990; Lamping et al., 1991). For example, when HIV-infected mothers remain healthy, their children are less likely to exhibit depressive symptoms (Murphy, Marelich, & Hoffman, 2002). Dorsey et al. (1999) found a linear increase in children's report of externalizing and internalizing difficulties as their mothers progressed through stages of HIV infection and AIDS. However, in some studies maternal HIV was not found to significantly add to the risk of child problem behaviors (Mellins, Brackis-Cott, Dolezal, & Meyer-Bahlburg, 2005).

Maternal and child/adolescent intermediate factors

Disclosure

Maternal disclosure of HIV can affect child adjustment, parent–child relationships, and the ability of parents to access resources. Many HIV-positive mothers do not disclose their HIV-positive status to their children because they believe the child might be too young to understand, or are concerned the child will disclose to others or be angry or fearful (Murphy, Steers, & Dello Stritto, 2001). However, overall, research indicates support for disclosure to children: (1) clinicians advise parents to disclose (Zayas & Romano, 1994; Armistead & Forehand, 1995); (2) mothers who have disclosed report significantly lower levels of depression (Wiener, Battles, & Heilman, 1998), and stronger family cohesion following disclosure; and (3) mothers typically report that their children are emotional at first but exhibit no lasting negative impact (Schrimshaw & Seigel, 2002; Murphy, Roberts, & Hoffman, 2006; Kennedy et al., 2007). Moreover, children who have been disclosed appear to be doing better on a number of measures compared with children who have not (e.g. Murphy et al., 2001; Murphy, Marelich, & Hoffman, 2002; Murphy, 2008).

Family functioning

Parental illness and family functioning have been linked in numerous research studies. For example, Dura and Beck (1988) found that families with maternal diabetes or chronic pain reported lower cohesiveness than families with no illness. Parental perceptions of the extent to which illness interferes with daily life have been inversely associated with perceptions of family cohesiveness (Mikail & von Baeyer, 1990). Moreover, family functioning has long been associated with child outcomes. In particular, family cohesion is associated with child resilience (Carbonell, Reinherz, & Giaconia, 1998) and has been found to mediate the relationship of negative life events to child depression (Roosa, Dumka, & Tein, 1996). In a large study HIV-positive parents in a European multi-center study (Nostlinger, Bartoli, Gordillo, Roberfroid, & Colebunders, 2006), with respect to influencing factors on children's emotional and behavioral symptoms, healthy general family functioning emerged as the best predictor.

Child/adolescent self-concept

Identity develops through processes of individuation and connectedness within the family (Hamilton, 1996). Having an HIV-infected mother is likely to affect developmental processes related to identity formation occurring in early and middle adolescence and thus influence self-concept. Children of women with breast cancer and of women with diabetes tend to score significantly lower on self-concept than children in a comparative control sample (Armsden & Lewis, 1994). Reyland, McMahon, Higgins-Delessandro, and Luthar (2002) found that children of HIV-seropositive mothers had lower self-esteem than children attending public school in the same community. But other factors may mediate parental illness effects on child self-concept. Murphy et al. (2001) found that among children affected by maternal HIV, for those children whose mothers had disclosed their HIV-positive serostatus, lower levels of negative self-esteem were found. Finally, behavioral and emotional problems may impact self-concept. Adolescents with depression have been shown to have a worse self-concept (McGrath & Repetti, 2002; Kolaitis & Liakopoulou, 2005).

Child mental health, behavioral, and social outcomes

As can been seen by the previous review of background factors and intermediate factors that may affect child outcomes, children affected by parental HIV/AIDS are at risk of poorer mental health, behavioral, and social outcomes. Somatic illness in a parent has long been considered a risk factor for psychological problems in children. Among families where the mother had breast cancer, one-third of the patients reported an increase in behavioral disorders in their younger children (Buckley, 1977). In a review of 15 years of literature on children of somatically ill parents, Romer, Barkmann, Schulte-Markwort, Thomalla, and Riedesser (2002) found that children of seriously ill parents had higher scores than controls on symptom scales, with a tendency toward internalizing symptomatology. Murphy, Greenwell, Mouttapa, Brecht, and Schuster (2006) have found that stability in HIV-infected mothers' health appears to be associated with a more rapid improvement in children's mental health over time.

Summary

In this study, selected variables from the PACT model (Figure 1) were analyzed. While some of these variables and associations have been evaluated in the PACT sample in many studies, this study takes a longitudinal perspective and includes more variables from the model to establish a 'bigger picture' of these families. Within the constraints of our limited sample size and statistical power, we included as many of the PACT variables as possible for formal model assessment. Maternal background factors of ethnicity and health status were included in the analysis. Maternal intermediate factors included disclosure of HIV status; family functioning; and maternal coping (specifically, physical functioning). The child intermediate factor included in the analysis was self-valuing (measured as self-concept). The main child outcome was mental health, specifically child depression.

Method

Participants

One hundred thirty-five mothers living with HIV/AIDS and their young, well children 6–11 years old were recruited from 14 sites in Los Angeles County (11 clinical primary care sites and 3 AIDS service organizations) from November 1997 to June 1999 into the PACT

study. PACT II followed up the majority of these families when the children were transitioning to early and middle adolescence.

Of the 135 mothers recruited for PACT I, 81 remained in the study across all 30 months, re-consented to participate in PACT II, and provided data at the PACT II baseline (36 additional families were recruited from June 2003 through October 2004 using the same procedures outlined above [with children aged 11–14.5 years], making the total sample of 118 for PACT II—however, for the current study only those available from both PACT studies were retained). PACT II baseline was conducted approximately 3 years after the last PACT I follow-up, and assessments were conducted every 6 months. Four time points from the PACT studies combined are included in the current analysis: PACT I baseline interview and follow-ups at 30 months, 66 months, and 84 months (numbered in 6-month increments from the first assessment—month total includes break between PACT I and PACT II grants). Some minor differences between the 81 mother/child pairs who reconsented for PACT II and the 54 who did not reconsent have previously been noted (see Murphy, Greenwell et al., 2006, for attrition analysis). No child differences were found, and only two maternal differences were evident; mothers who could not participate in PACT II due to losing custody of the child reported higher family conflict scores, and mothers who had died (and thus could not participate) showed lower CD4 counts than those who reconsented.

At PACT I baseline for the 81 participants, mothers' mean age was 35.0 years (SD = 5.96; ranging from 23 to 52 years); of the total participants, 34.6% were African American, 30.9% Latina, 25.9% white, and the remainder other/mixed ethnicity. Those married comprised 19% of the sample, while 36% reported never being married, 23% widowed, 14% separated, and 9% divorced. Approximately 26% had completed high school, while 51% had not completed high school—the remainder had completed some college, had a college degree, or had attended a technical school. The majority (81.5%) were unemployed.

The mean age of children in the study at PACT I baseline was 8.43 years (SD = 1.83; ranging from 5 to 12 years using mothers' report). At 66 months (PACT II baseline), mean age was 13.44 years (SD = 1.93; ranging from 10 to 17 years). By 84 months, mean age was 14.83 years (SD = 1.90; ranging from 12 to 19 years). Overall, 53.1% of the children were male.

Inclusion criteria for PACT I were as follows: mother had AIDS or was HIV symptomatic; she had a well child aged 6–11 years; and she was English or Spanish speaking. HIV symptomatic was defined using the CDC Guidelines for $CD4^+$ T Lymphocyte Category 2 and Clinical Category B, including a CD4 count between 200 and 400 and the occurrence of a specified opportunistic disease or the occurrence of diseases for which treatment was complicated by HIV. Medical chart abstraction was conducted to verify eligibility. Of the 214 mothers contacted for study participation, 24% were ineligible based on the above criteria and 13% chose not to participate.

Procedures

Clinic staff at recruitment sites referred eligible families, and flyers and brochures allowed patients/clients to contact study staff directly. Interviewers only discussed the mother's diagnosis with children when prior child knowledge was confirmed through both parent report and child confirmation of that knowledge through an indirect screening. After receiving a description of the study, mothers who agreed to participate signed the Institutional Review Board (IRB)-approved Informed Consent forms and children signed the assent form. Trained bilingual interviewers conducted face-to-face interviews in the family's home.

For both PACT I and PACT II, interviews of mothers and children/adolescents were conducted separately using a computer-assisted interviewing program (CAPI) on laptop computers. Interviews with mothers lasted 1.5 hours and interviews with children/adolescents lasted 1 hour. Mothers received an incentive of $35.00 and children/adolescents received $25.00.

Measures

Background factors

- *Maternal ethnicity (baseline)*: Mothers were asked to report their ethnicity (Asian/Pacific Islander; Black or African American; Native American/American Indian; White; Hispanic [Spanish] or Latino Origin, or Other or Mixed Ethnicity).
- *Maternal disclosure (baseline)*: Mothers were asked how much their child knew about their HIV status. If the child knew the mother had HIV or AIDS, disclosure status was coded with a '1', otherwise disclosure was coded '0'.
- *Maternal viral load and CD4 cell count (baseline)*: Mothers' health status was assessed using viral load and CD4 cell counts from medical records abstraction. Missing medical abstract CD4 cell count and viral load values were replaced with available self-report measures (a Pearson correlation of medical abstract CD4 and self-report CD4 was 0.77; viral load correlation between medical abstract/self-report was 0.74). Eight cases were missing baseline CD4 and were replaced with self-report. Seven cases were missing viral load, and four were replaced with self-report. Viral load was highly skewed, and a log transformation was applied (a '1' constant was added prior to transformation due to zero values) to adjust the distribution.
- *Child gender and age (baseline)*: Mother's report of child's age and gender was collected.
- *Maternal physical functioning (66 months)*: The Medical Outcome Short Form 36 was administered to mothers (Ware & Sherbourne, 1992), and the 10-item physical functioning subscale was chosen because it is based on a mother's report of her activity limitations rather than how she felt. Higher scores indicate better functioning. Internal consistency reliability for the current sample is 0.91.

Intermediate factors

- *Family functioning (30 months)*: The subscale measuring family cohesion from the Family Functioning Scale (Bloom & Naar, 1994) was administered to mothers. Higher scores indicate more family cohesion. Internal consistency reliability for the current sample is 0.66.
- *Self-concept (66 months)*: The Piers–Harris Children's Self-Concept Scale (Piers, 1993) was administered. Subscales for this study and alphas are as follows: Physical Appearance and Attribution, 0.84; Happiness and Satisfaction, 0.63; Popularity, 0.71; and Intellectual and School Status, 0.77.

Child outcomes

- *Child depression (84 months)*: The Children's Depression Inventory (CDI; Kovacs, 1992) was administered. The scale consists of five subscales: Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self-Esteem. Total score reliability for the current sample is 0.91.

Analysis

A sequential longitudinal design (MacCallum & Austin, 2000) was adopted to test the PACT model. Model evaluation was performed using EQS (Bentler, 2006), applying full information maximum likelihood (FIML). Beyond direct associations, indirect effects of exogenous variables using a Sobel test extension were evaluated (Bentler, 2006; see James, Muliak, & Brett, 2006, for SEM mediation interpretation). Stability of the model fit statistics and parameter estimates were assessed using a model-based bootstrap procedure, with resampling fixed to our sample *N*, and requesting 1,000 bootstrap samples. Observed means and standard deviations for indicator variables are presented in Table 1.

Results

To assess the model, due to limited sample size, we used select measurement variables representing different points of time. Final predictor variables include baseline measures from PACT I (mother's ethnicity, illness status [CD4, viral load], serostatus disclosure), a 30-month follow-up measure from PACT I (mothers' perception of family cohesion), and baseline measures (66 months) from PACT II (mothers' physical functioning; the Piers–Harris subscales representing the latent construct of childs' self-concept). Child depression (our main outcome) was taken at 84-month follow-up from PACT II, consisting of the five CDI subscales representing the latent construct of child depression. See Table 2 for observed pair-wise correlations between the 15 measured variables. For the Piers–Harris and CDI subscales, a latent construct approach was adopted since the subscales function as multiple indicators around the construct centroid (Little, Lindberger, & Nesselroade, 1999) which may lead to better construct measurement as opposed to global indicators.

Two proposed background factors (gender, age) are not included in the final proposed model. Early exploratory runs yielded poor associations between these variables and adolescent depression and between those variables and other model variables. Because we

Table 1. Observed means and standard deviations of proposed PACT model variables.

Variables	M	SD	Min, max
Ethnicity (0 = non-white, 1 = white)[a]	0.26	0.44	0, 1
Disclosure (0 = no, 1 = yes)[a]	0.36	0.48	0, 1
CD4 cell count	388.12	280.99	13, 1664
Viral load (log with +1 constant)	2.77	1.51	0, 5.44
Family cohesion	15.97	2.38	10, 20
Physical functioning (MOS 36)	71.30	26.53	0, 100
Self-concept (Piers–Harris)			
Intellectual and school status	13.41	2.59	7, 17
Physical appearance	10.73	2.81	2, 13
Popularity	10.11	2.03	4, 12
Happiness and satisfaction	9.30	1.20	4, 10
Depression (CDI)			
Negative mood	1.10	1.41	0, 7
Interpersonal problems	0.52	1.03	0, 5
Ineffectiveness	1.32	1.65	0, 7
Anhedonia	1.94	2.16	0, 9
Negative self-esteem	0.46	0.94	0, 5

[a]Percentages for ethnicity (26% non-white) and disclosure (36% non-disclosure).

Table 2. Observed pairwise Pearson correlations and sample size of proposed model variables *r* (*N*).

Measures	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Baseline															
(1) CD4 baseline	–														
(2) Viral load baseline	–0.37 (78)	–													
(3) Disclosure baseline	–0.06 (81)	–0.05 (78)	–												
(4) Mothers' race/ethnicity	0.16 (81)	–0.08 (78)	0.03 (81)	–											
30-month FU															
(5) Family cohesion	0.13 (69)	–0.04 (66)	0.20 (69)	0.01 (69)	–										
6-month FU															
(6) Physical functioning	0.13 (81)	–0.03 (78)	–0.11 (81)	0.19 (81)	–0.20 (69)	–									
Child self-concept															
(7) Intellectual and school status	–0.02 (81)	–0.07 (78)	0.20 (81)	–0.21 (81)	0.00 (69)	0.18 (81)	–								
(8) Physical appearance and attributes	–0.22 (77)	–0.24 (74)	0.16 (77)	–0.09 (77)	–0.07 (65)	0.05 (77)	0.68 (77)	–							
(9) Popularity	0.06 (80)	–0.10 (77)	0.09 (80)	–0.02 (80)	–0.11 (68)	0.20 (80)	0.60 (80)	0.54 (77)	–						
(10) Happiness and satisfaction	–0.20 (79)	–0.05 (76)	0.14 (79)	–0.11 (79)	0.08 (67)	0.12 (79)	0.53 (79)	0.56 (77)	0.44 (78)	–					
84-month FU															
Child depression															
(11) Negative mood	0.01 (71)	–0.16 (68)	–0.07 (71)	0.07 (71)	0.09 (60)	–0.21 (71)	–0.17 (71)	–0.30 (67)	–0.29 (70)	–0.25 (69)	–				
(12) Interpersonal problems	0.01 (71)	–0.02 (68)	0.03 (71)	–0.03 (71)	0.05 (60)	–0.04 (71)	–0.17 (71)	–0.12 (67)	–0.01 (70)	–0.13 (69)	0.24 (71)	–			
(13) Ineffectiveness	0.01 (71)	0.14 (68)	–0.17 (71)	0.08 (71)	0.23 (60)	–0.12 (71)	–0.57 (71)	–0.55 (67)	–0.40 (70)	–0.43 (69)	0.30 (71)	0.22 (71)	–		
(14) Anhedonia	0.00 (71)	–0.10 (68)	–0.04 (71)	0.19 (71)	0.12 (60)	–0.09 (71)	–0.31 (71)	–0.23 (67)	–0.28 (70)	–0.12 (69)	0.49 (71)	0.21 (71)	0.42 (71)	–	
(15) Negative self-esteem	0.12 (71)	0.13 (68)	–0.28 (71)	0.25 (71)	–0.03 (60)	0.05 (71)	–0.34 (71)	–0.48 (67)	–0.23 (70)	–0.23 (69)	0.44 (71)	0.32 (71)	0.40 (71)	0.52 (71)	–

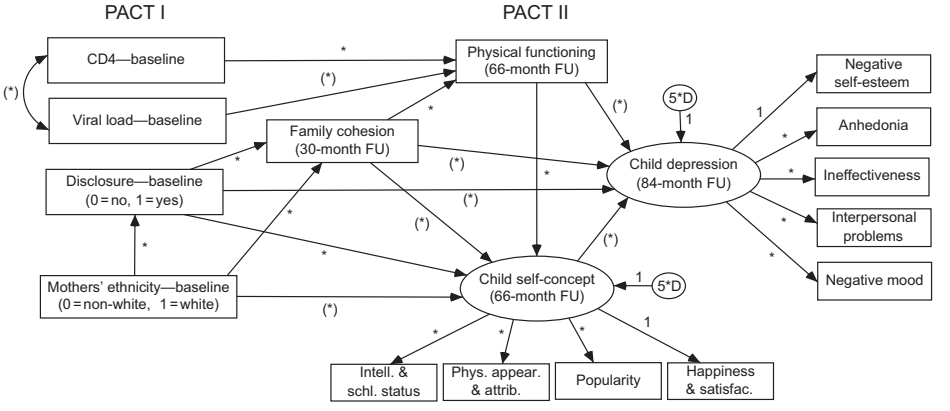

Figure 2. Hypothesized measurement model for PACT over 83 months. Observed variables are shown within rectangles and latent constructs are shown within ellipse.
Notes: Estimated parameters are noted with a '*'. A '*' in parentheses indicates hypothesised negative association. Error variance terms for measured variables are not shown.

had to be selective in the measured variables, both gender and age were removed as exogenous variables.

To assess the proposed model (Figure 2), we allowed disturbance terms for the constructs with multiple indicators (e.g. self-concept, child depression) to vary and provided start values of 5, although we set one indicator path to 1.0 for identification purposes. Error variances for all endogenous variables were allowed to vary. Regarding assumptions, two cases were possible multivariate outliers but were retained due to small sample size considerations. Multicollinearity was not evident based on bivariate correlations of model variables (Table 2), multicollinearity diagnostics on the observed data, or tolerance defaults in EQS. The assumption of multivariate kurtosis (assessed using the Bonett–Woodward–Randall test; Bentler, 2006) was violated. Thus, 'robust' model fit indices were requested, including the Yuan–Bentler Scaled χ^2, the Comparative Fit Index (CFI), the Incremental Fit Index (IFI), the Non-Normed Fit Index (NNFI), and the Root Mean Squared Error of the Approximation (RMSEA). Robust standard errors were used to assess model parameter significance.

A test of Figure 2 yielded a Yuan–Bentler Scaled χ^2 of 253.03 ($df = 84$), with a CFI of 0.94, an IFI of 0.94, an NNFI of 0.92, and a RMSEA of 0.111 (90% CI = 0.085–0.135). Because these indices suggest ill fit, the standardized residuals from the model were evaluated to improve fit. One indicator, the log of viral load, exhibited a large standardized residual and was removed from the model. Nonsignificant paths ($p > 0.10$) were also removed. A new model (Figure 3) yielded a Yuan–Bentler Scaled χ^2 of 184.86 ($df = 76$), with a CFI of 0.98, an IFI of 0.98, an NNFI of 0.98, and a RMSEA of 0.059 (90% CI = 0.000–0.091), suggesting good fit. Total variance accounted for in child self-concept by the predictors was 21%, and 45% was accounted for in child depression.[1] Model-based bootstrap verified the stability of these findings. Of the 1,000 samples drawn, 995 converged with a mean average Yuan–Bentler Scaled χ^2 of 165.23 (mean SD = 29.87), placing the final χ^2 test statistic within 1 SD of the 995 replications (similar validation was found for the CFI and RMSEA—no statistics are available for the other measures). Parameter estimates were assessed calculating new *z*-statistics based on the bootstrap standard error means—all maintained the same level of significance as noted in our final model.

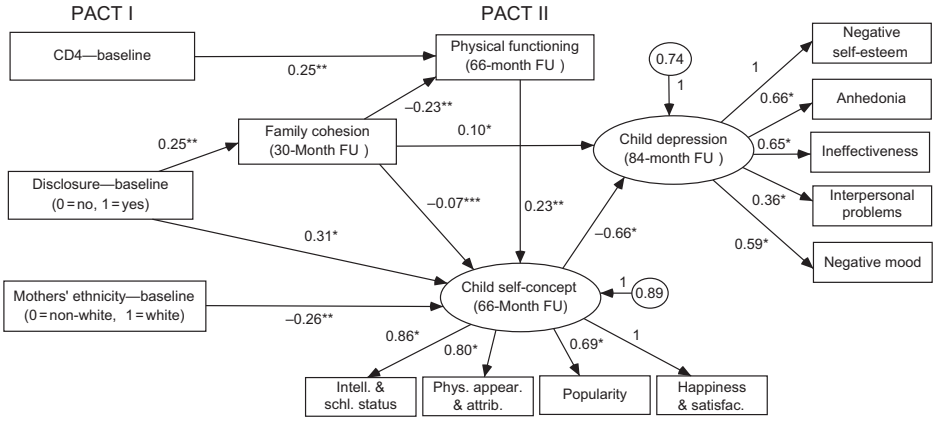

Figure 3. Final standardized parameter estimates for PACT measurement model after modifications.
Note: Error variance terms for measured variables not shown. *$p < 0.01$; **$p < 0.05$; ***$p < 0.10$.

Final model parameter estimates are in Figure 3. All paths are significant at 0.05 or better except from family cohesion to child self-concept ($p < 0.10$). As hypothesized, disclosure was positively associated with family cohesion and self-concept; those mothers who had disclosed their HIV status to their families reported higher levels of physical functioning. Higher CD4 counts at baseline were also associated with higher reports of mothers' physical functioning. However, counter to hypotheses, higher family cohesion was associated with lower levels of physical functioning, lower levels of self-concept, and higher levels of child depression. As hypothesized, higher self-concept was associated with lower levels of child depression.

A number of indirect associations were noted ($p < 0.05$) on child depression utilizing a Sobel test extension. Although these indirect associations are suggestive of mediation effects, a definitive assessment cannot be made since the complete complement of PACT model variables were not available. However, we have retained the mediation labels suggested by James et al. (2006) since they are descriptive of the variable relationships. Associations resembling complete mediation (indirect effects only are noted for a predictor on an endogenous outcome) were noted for both CD4 count (through physical functioning and child self-concept) and physical functioning (through child self-concept). Higher CD4 counts were indirectly associated with lower child depression (standardized indirect coefficient [IC] = –0.04), and higher physical functioning was indirectly associated with lower child depression (IC = –0.15). Associations resembling partial mediation (both indirect and direct effects are noted for a predictor on an endogenous outcome) were noted for family cohesion (through child self-concept) on child depression; higher family cohesion was indirectly associated with higher child depression (IC = 0.08).

Discussion

This was a preliminary study of the model for the PACT project. Overall, partial support was found for the PACT model (Murphy, Marelich, et al., 2006), evidencing associations through which maternal illness level affects child depression, which are also influenced by child and parent background and situational factors.

Maternal physical functioning as measured by CD4 counts at baseline is associated with later maternal physical functioning, which in turn is related to child self-concept (with higher maternal physical functioning associated with better child concept), which subsequently influences child depression (higher self-concept is related to lower levels of depression). Maternal physical functioning has an indirect effect on child depression through child self-concept, and maternal disclosure (of her serostatus to the child) has an indirect effect on child depression. Maternal disclosure is also associated directly with self-concept: when disclosure has occurred, child self-concept is better. This is consistent with studies indicating that children aware of their mother's HIV status are doing well compared with children unaware of their mothers' status (Murphy et al., 2001; Murphy, Marelich, & Hoffman, 2002; Schrimshaw & Seigel, 2002).

Interestingly, maternal ethnicity was negatively associated with child self-concept for white mothers. This is consistent with previous literature indicating that minority youth report higher self-esteem than white youth (Gray-Little & Hafdahl, 2000). However, it should be noted that we had only a rough analysis of ethnicity given the fact that the majority of our mothers were either Latina or African American. Future studies will need to further investigate ethnicity findings.

One unanticipated finding was that higher family cohesion was associated with lower levels of maternal physical functioning, poorer child self-concept, and higher child depression. There are several studies of families affected by HIV and cancer that have also reported this association. Among families affected by maternal HIV, Bauman, Camacho, Silver, Hudis, and Draimin (2002) reported that family cohesion was a risk factor for poorer child depression controlling for other protective factors. Similarly, among parents of children with cancer, Sloper (2000) found that family cohesion predicted distress at a later time point. The explanation postulated was Dolgin and Phipps' (1996) suggestion that the construction of family is related to the idea of centripetal and centrifugal forces, which operate around events in the normal family life cycle to draw families together or pull them apart. That is, certain challenges serve to pull a family together (centripetal orientation, such as adding a child to a family), whereas some challenges pull a family apart (centrifugal, such as an adolescent preparing to leave home). Serious illness in a family member is generally thought to produce centripetal forces (Moore, Stambrook, & Peters, 1993), which may explain increased cohesion reported in families with a member with cancer (Dolgin & Phipps, 1996). When a family is in centripetal orientation, the normative stresses combined with illness-related stresses can be additive and family cohesion may become excessive, leading to enmeshment. And although serious illness is generally seen as producing centripetal forces, if it occurs in families that are already undergoing centrifugal forces, greater family disengagement may result.

Houtzager et al. (2004), in a study of coping and family functioning of siblings of childhood cancer patients, found that adjustment problems were associated with high family adaptation and cohesion. The authors noted that their finding was congruent with the so-called circumplex model of family functioning (Olson, Sprenkle, & Russell, 1979), where family cohesion is defined as the amount of closeness and mutual involvement experienced in the family system. Moderate levels of cohesion are considered to be related to the most favorable adjustment outcomes in families faced with stress, whereas extreme levels of cohesion may be related to less adaptive functioning. Our previous research found cohesion to be in the direction expected here (e.g. conflict between mothers and their partners associated with lower family cohesion, and higher maternal depression associated with lower family cohesion; Murphy, Marelich, Dello Stritto, Swendeman, & Witkin, 2002). However, findings in this study were unexpected and are consistent with

the literature reviewed in this section regarding enmeshment. Future research utilizing cohesion in similar populations may wish to consider both the positive and negative effects of cohesion when specifying hypotheses. For example, it is plausible that cohesion could have a curvilinear relationship with the stated outcomes, although in this article this was investigated post hoc but not found tenable. Alternatively, a clearer picture of cohesion could emerge using repeated measures or growth curve analyses.

One major limitation to this study is the level of child depression in our sample. Although self-concept was directly associated with depression (lower levels of self-concept predicting higher levels of depression, agreeing with past research between depression and self-esteem [Bhatti, Derezotes, Kim, & Specht, 1989; Battle, 1990; Orvaschel, Beeferman, & Kabacoff, 1997; Alfeld-Liro & Sigelman, 1998]), only 11% of children had CDI total depression scores indicating clinical depression (cutoff of 12; Nelson, Politano, Finch, Wendel, & Mayhall, 1987; American Psychiatric Publishing Inc., 2008), with another 13% borderline (scores from 9 to 11). Hence, a majority of our sample children were not clinically depressed. However, other studies indicate the CDI is better suited as a continuous measure of mood (Matthey & Petrovski, 2002), and the current results should be viewed with this in mind. It may be more accurate to state for the current study that greater negative mood is a function of lower levels of self-concept.

Another limitation is sample size. To address this, we took a number of steps. We limited the number of measured variables and parameters estimated since ratios between sample *N* and parameters can affect modeling outcomes (Jackson, 2003). We also utilized a bootstrap procedure to assess fit on 'like' samples and found our final model results tenable. Finally, an alternative model using coping[1] derived similar findings to the main model. Thus, although we had less power, effects were indeed found with good model fit. Another caveat is the reported indirect effects. Although these are suggestive of mediation, we did not have data reflecting all the PACT model variables that could be influencing factors. The reported indirect findings should not be viewed as evidence of mediation. Additionally, as with other covariance structural analyses, alternative arrangements of the variables/paths could yield plausible models. Therefore, our results may reflect statistical artifact.

A final limitation is the static as opposed to dynamic nature of the current statistical analysis. The model predicts child depression at 84 months, but does not account for previous levels of depression (this applies as well to the other non-baseline measures). A superior analysis would be to evaluate the model with measurements of the variables at each time point and adopt a latent curve approach with these measurements as time-varying covariates (Bollen & Curran, 2006) to account for prior levels. This approach could also account for continued change in CD4 cell counts, maternal disclosure, and family cohesion. Such an analysis was considered but deemed impossible due to sample size. Whether the model could be confirmed adjusting for prior levels and/or continued change in variables cannot be ascertained at this time, nor can causality be intimated given the correlational nature of data.

There are a number of important implications from this study. First, as Bauman et al. (2002) have noted, if instead of very high family cohesiveness being a protective factor it is a risk factor for poorer child mental health, then these families are enmeshed. Very highly cohesive families may need to be targeted with specific interventions to assist children coping with parental illness (Bauman et al., 2002, p. 50). Among these PACT families, higher family cohesion was associated with poorer maternal physical functioning. For example, perhaps family members do too much for the mother in an effort to help, thus impinging on her exercise and thus negatively effecting physical health outcomes.

The second implication from this study focuses on improving depression levels of children affected by maternal HIV. Child concept was found to be directly associated with child depression among children affected by maternal HIV/AIDS. Self-concept has been postulated to be a main foundation for all motivated behavior, and that it gives rise to possible selves (Franken, 1994). Moreover, self-concept is constructed by an individual through interactions with the environment and through considering those interactions (Huitt, 2004), indicating it can be modified. Numerous studies on interventions to improve the self-concept of children with learning problems have shown that self-concept can be improved (Elbaum & Vaughn, 2001). Thus, one implication is that interventions focused on improving self-concept among children affected by maternal HIV who have depressive symptoms could assist these children in decreasing their depression. To our knowledge, no such studies have been conducted. A limited number of intervention studies with children of parents with somatic illness have been reported, and most have had no systematic evaluation (Diareme et al., 2007). Gunther, Crandles, Williams, and Swain (1998) conducted a group psychotherapy program for children of parents in all phases of AIDS that focused on healthy coping and developing peer support and found the intervention assisted children in terms of their feelings of isolation and depression, but the outcomes were based only on clinical report.

We have speculated that targeting self-concept may improve depression; however, the directionality may be reversed, in that targeting depression may improve self-esteem. Interventions may need to target the constructs that affect self-concept, meaning that interventions would also need to target healthy disclosure and child depressive symptoms, as well as family cohesion with an emphasis on positive cohesion rather than enmeshment. Future interventions for adolescents of HIV-positive mothers should investigate strategies designed to directly improve these constructs.

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Note

1. A second model was evaluated replacing child's self-concept with child's coping to assess further the effects of a child intermediate factor on depression. Coping was measured using four items from the Child General Coping Efficacy scale (Sandler et al., 1994): the degree to which coping strategies employed during the past month were effective in making them feel better; the degree to which they were satisfied with the strategies they employed; how well they felt they handled their problems compared to other kids; and how well they thought they would cope in the future. Fitting the same paths from the Figure 3, fit statistics showed a Yuan–Benter Scaled χ^2 of 193.48 (*df* = 76), with a CFI of 0.98, an IFI of 0.98, an NNFI of 0.98, and a RMSEA of 0.060 (90% CI = 0.000–0.092). Although model fit is good, a major difference between paths in this model and those in Figure 3 was in the 'prediction of childs' self-concept; mothers' ethnicity was the only significant direct path. Other outcomes were essentially the same.

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