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Evaluating Impacts of a Multilevel Resilience-Based Psychosocial Intervention on Mental Health of Children Affected by Parental HIV in China

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Abstract

Background: Children affected by parental HIV are commonly exposed to multiple risk factors, including parental illness and death, other traumatic life events, HIV stigma, and poverty, all of which in turn put them at elevated risk of experiencing poor mental health outcomes. Previous research has suggested the promise of psychosocial interventions in improving mental health for children affected by parental HIV through an integrated and multilevel resilience-based approach. However, there are few multilevel resilience-based interventions for this group, and the efficacy of such interventions on mental health outcomes has not been fully examined. Furthermore, very few studies have examined whether resilience-based interventions impact various sub-populations differently or explored the mechanisms through which such intervention effects occur. Therefore, the first aim of this dissertation research was to examine the short-term efficacy (e.g., up to 18 months) of the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention, a multilevel resilience-based psychosocial intervention, on selected mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness) among children affected by parental HIV, as well as testing the potential moderation roles of gender and age in the intervention effects. The second aim of this dissertation research was to examine whether the ChildCARE intervention would yield improvement in mental health beyond 18 months of follow up and whether emotional regulation and coping would act as the potential mechanisms of change through which the ChildCARE intervention improves mental health outcomes for these children.

Methods: The ChildCARE intervention is a culturally tailored intervention developed for children affected by parental HIV in China, which consists of intervention components at three levels: child, caregiver, and community. The intervention was evaluated using a 4-arm community-based cluster randomized controlled trial with a sample of 790 children 6-17 years of age (51.6% boys) affected by parental HIV in a rural county in central China from 2012 to 2016. Children and their primary caregivers were randomly assigned by school clusters to a control condition or one of three intervention conditions (i.e., child-only, child + caregiver, child + caregiver + community). Of the three intervention conditions, children and caregivers assigned to the child-only condition were provided child intervention component only, those assigned to the child + caregiver condition were provided both child and caregiver intervention components, and children and caregivers assigned to the child + caregiver + community condition were provided all three intervention components. Data on depressive symptoms, school anxiety, loneliness, emotional regulation, coping, and demographic characteristics were collected from children via self-report at baseline and every six months over 36 months.

Results: Overall, the ChildCARE intervention yielded some short-term improvements in depressive symptoms and loneliness, but these improvements were not sustained at 18 months or beyond for children affected by parental HIV. Older children (i.e., ≥ 12 years of age) benefited more from the intervention than their younger counterparts (i.e., < 12 years). Mediation analyses further showed that the ChildCARE intervention yielded significant improvements in positive coping, but not emotional regulation or negative coping at 18 months, whereas changes in emotional regulation, positive coping, and

negative coping were consistently associated with depressive symptoms, school anxiety, and loneliness.

Conclusions: The findings in this research provide support for the benefits of the ChildCARE intervention on mental health outcomes but highlight the challenges in producing robust, long-term impacts for children affected by parental HIV in central China. This research also suggests the important roles of emotional regulation and coping in influencing mental health outcomes for these children.

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Chapter 1

Introduction

1.1. Mental Health and Resilience among Children Affected by Parental HIV

Due to the worldwide HIV epidemic, the United Nations International Children's Emergency Fund (UNICEF) estimated that as of 2017, about 12.2 million children under 18 years of age had lost one or both of their parents to AIDS-related illness, with millions more facing this risk due to their parents' positive HIV status (UNICEF, 2017). These children are often referred to as children affected by parental HIV (e.g., Chi and Li, 2013). Parental death is one of the most devastating events for children due to its long-lasting adverse impact on developmental outcomes, including mental health (Marcussen et al., 2015; Finkelstein, 1988). In the context of HIV, however, not only children who lose their parents are at elevated risk, but those of parents living with HIV are also more likely to experience adverse mental health outcomes, including depressive symptoms, anxiety, loneliness, posttraumatic distress, compared to children from HIV-unaffected families (i.e., no known HIV infection in the family, Chi and Li, 2013). The elevated risk for poor mental health among this group is partly driven by the complex nature of adversity they may experience, including but not limited to HIV stigma, traumatic life events, and poverty (Cluver and Orkin, 2009; Tompkins and Wyatt, 2008; Cluver et al., 2013; Sherr et al., 2016; Li et al., 2009).

Some children, however, thrive in the face of adversity (Masten et al., 1990). Studies have shown that not all children affected by parental HIV would exhibit clinically

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significant or prolonged, elevated levels of mental health symptoms (Chi et al., 2014; Lester et al., 2006). This phenomenon is conceptualized mainly in the conceptual framework of resilience, which is defined as "a dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar et al., 2000: p. 453). To gain a better understanding of the development of resilience among children affected by parental HIV, Li and colleagues (2015) developed a psychosocial resilience framework specific to this group. In the framework, the authors recognize the importance of using an ecological perspective to understand resilience and elucidate how children's internal assets, together with resources from the family and community, may promote positive adaptation in the face of parental HIV and related adversities.

Importantly, the integrated resilience framework of Li et al. (2015), in line with previous studies, suggest the promise of resilience-based interventions that target more than one ecological system (e.g., multilevel interventions) in improving mental health for children affected by parental HIV (Betancourt et al., 2013). To date, however, there is a lack of interventions targeting multilevel ecological systems (e.g., child, family, community) to promote mental health for this group, and data examining the efficacy and the mechanisms of such interventions are limited.

1.2. Research Objectives and Aims

The overall objective of this research was to evaluate the efficacy of the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention, a multilevel, resilience-based, psychosocial intervention, on mental health outcomes for children affected by parental HIV, as well as examining for whom and how the ChildCARE intervention may work. The ChildCARE intervention was based upon the psychosocial resilience framework for

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children affected by parental HIV, which suggests that intervention should target three levels: child, caregiver, and community (Li et al., 2017b; Li et al., 2015). This intervention was designed to strengthen children's internal assets (e.g., coping skills), resources from family (e.g., positive parenting), and resources from the community (e.g., social cohesion) in order to ultimately facilitate positive outcomes (e.g., better mental health). The evaluation of the ChildCARE intervention was conducted using a 4-arm community-based cluster randomized controlled trial (RCT) from 2012 to 2016 in central China. The 4-arm cluster RCT allowed the examination of the effects of three intervention conditions (i.e., child-only, child + caregiver, child + caregiver + community) on a variety of developmental and psychosocial outcomes. The current research focused on a subset of mental health outcomes with the following specific aims and research questions.

Specific Aim 1: To test the short-term efficacy of the ChildCARE intervention on selected mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness), as well as the potential moderators underlying the intervention effects, among children affected by parental HIV.

Research Question 1a: What are the impacts of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness at 6, 12, and 18 months?

Research Question 1b: Are there any additive effects of the ChildCARE intervention components on mental health outcomes for children who received more than one intervention component (i.e., child + caregiver, child + caregiver + community)?

Research Question 1c: Do some key demographic variables (i.e., gender, age) moderate the intervention effects for mental health outcomes?

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We hypothesized that (1a) compared to the control group, intervention groups would exhibit more reductions in depressive symptoms, school anxiety, and loneliness at 6, 12, and 18 months; (1b) there would be additive effects of the ChildCARE intervention such that the intervention effects would be greater in children who received additional intervention components than children who received only child intervention component; and (1c) there would be gender and age differences in the intervention effects for depressive symptoms, school anxiety, and loneliness.

Specific Aim 2: To examine the efficacy of the ChildCARE intervention on selected mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness) beyond the 18 months of follow-up and to identify the potential mechanisms of change through which the ChildCARE intervention works.

Research Question 2a: What are the impacts of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness beyond 18 months of follow-up (i.e., 24 months, 30 months, 36 months)?

Research Question 2b: Would emotional regulation and coping mediate the effects of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness?

We hypothesized that (2a) the ChildCARE intervention would result in decreases in depressive symptoms, school anxiety, and loneliness beyond 18 months of follow-up, and (2b) the effects of the intervention on these mental health outcomes would be mediated by emotional regulation and coping.

1.3. Justification

Millions of children are at elevated risk of experiencing poor mental health due to the complex challenges associated with parental HIV (UNICEF, 2017; Chi and Li, 2013;

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Foster et al., 2005; Goldberg and Short, 2016). It is also anticipated that many children will continue to be affected by parental HIV, given that more than 1 million adults are newly diagnosed with HIV positive each year (UNAIDS, 2018). By examining the efficacy of a multilevel resilience-based intervention on mental health, this research will provide rigorous evidence to help identify effective psychosocial interventions for this group. Furthermore, this research will provide insight into the development of effective theory-based interventions by testing the mechanisms of change underlying a resilience-based intervention. These findings will also contribute to a better understanding of the resilience process for children made vulnerable by HIV.

1.4. Preview

This dissertation consists of five chapters. Chapter 1 briefly introduces the background of research questions and the overall objectives of this research. Chapter 2 presents a review of the existing literature. Chapter 3 describes the methodology, as well as the ChildCARE intervention in detail. Chapter 4 summarizes the results in the form of two manuscripts. Chapter 5 presents an overall discussion of the research findings and implications.

Chapter 2

Background and Significance

This section will provide a review of the literature on the impact of parental HIV on children's mental health outcomes with a focus on depressive symptoms, anxiety, and loneliness. Furthermore, the concept of psychological resilience and previous resilience research for children affected by parental HIV will also be discussed in detail. Lastly, an introduction of potential moderators and mediators underlying the effect of the resilience-based intervention will be presented. Identifying the potential moderators and mediators in the intervention effects helps to understand "for whom or under which situation" an intervention may work and "how" an intervention works. Specifically, an introduction with a focus on gender and age as the moderators and emotional regulation and coping as the mediators will be provided, given that previous studies have documented the potential gender and age differences in the intervention effects on children's mental health (Dray et al., 2017), and that emotional regulation and coping are two theorized mechanistic factors underlying the ChildCARE intervention (Li et al., 2015; Li et al., 2017b).

2.1. Statistics for Children Affected by Parental HIV

In line with UNICEF's definition, children affected by parental HIV, for the purpose of this research, are referred to as children under age of 18 who have lost one or both parents to AIDS-related illness (hereafter referred to as AIDS orphan) and those who have one or both parents living with HIV ((hereafter referred to as vulnerable children; Chi and Li, 2013). The population of AIDS orphans has declined in recent years; as of

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2017, however, there were still estimated to be around 12.2 million AIDS orphans worldwide, with millions more currently living with HIV-positive parents (UNICEF, 2017). Among children affected by parental HIV, it is estimated that over 90% reside in sub-Saharan Africa (UNAIDS, 2016). Recent data on the number of vulnerable children and AIDS orphans were not available in China. Based on early estimations, about 496,000 to 894,000 children were affected by HIV because of their parents' HIV positive status or their own HIV positive status by the end of 2010, of which approximately 20,000 to 27,000 were AIDS orphans (UNICEF, 2011). Of children affected by parental HIV in China, many reside in Henan Province (Hong et al., 2010). In the 1990s, Henan faced the most severe burden of the HIV epidemic in China, primarily caused by the unhygienic commercial blood and plasma collection practices among rural villagers (Deng et al., 2008; Li et al., 2010b). A sentinel surveillance survey conducted in Henan indicated that the HIV prevalence among former plasma donors was 8.6% (range: 0.09% to 13.0%), accounting of 85.6% of all reported HIV positive cases in 2004 (Li et al., 2010b). In 2003, it was estimated that there were more than 10,000 HIV positive cases reported, and more than 2,000 children had lost one or both of their parents to AIDS-related illness in Henan (UNICEF, 2007).

2.2. Parental HIV and Mental Health in Children

In the past two decades, a growing body of research has examined the adverse impact of parental HIV on children's mental health (Chi and Li, 2013; Islam et al., 2015; Sharp et al., 2015). It is recognized that parental death has a long-lasting effect on child development (Yamamoto et al., 1996), because of the vital role of parents in shaping children's adaptive social, mental, and physical development (Bowlby, 2008; Winston

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and Chicot, 2016). The loss of a parent, therefore, not only puts children at risk of experiencing intensive emotional distress, but also may impede their development of healthy emotional regulation and coping skills, rendering them emotionally vulnerable (Luecken and Roubinov, 2012; Krupnick, 1984; Tyrka et al., 2008; Luecken et al., 2009; Morris et al., 2007). Children of parents living with HIV are also at elevated risk of experiencing poor mental health outcomes, partly due to the reduced quality of parenting and care and pervasive HIV stigma (Bogart et al., 2008; Lin et al., 2010; Surkan et al., 2010; Forehand et al., 2002; Lachman et al., 2014).

A recent systematic review of psychosocial wellbeing among children affected by parental HIV found that the existing studies, overall, reported higher levels of mental health symptoms, including but not limited to depression, anxiety, and loneliness, among children affected by parental HIV, compared to children from HIV-unaffected families (Chi and Li, 2013). In the review by Chi and Li (2013), such an elevated risk for poor mental health outcomes among children affected by parental HIV was documented in multiple cultural contexts, including China (Fang et al., 2009; He and Ji, 2007), South Africa (Cluver et al., 2007; Onuoha et al., 2009; Killian and Durrheim, 2008), Uganda (Onuoha et al., 2009), Ghana (Doku, 2009), the United States (Forehand et al., 1998), and Italy (Esposito et al., 1999).

More recent cross-sectional studies also indicate that children affected by parental HIV are at higher risk of experiencing depression and anxiety than their counterparts from HIV-unaffected families in Ghana (Doku and Minnis, 2016) and India (Kumar et al., 2014; Sg et al., 2016). In addition, similar results have been observed in longitudinal studies (Forehand et al., 2002; Cluver et al., 2012). For example, Cluver et al. (2012)

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found that AIDS orphans reported higher scores on the Child Depression Inventory than non-orphans at baseline (3.11 vs. 2.14) and four years later (3.93 vs. 2.41). In the same study, AIDS orphans also reported higher scores on the Children's Manifest Anxiety Scale-Revised than non-orphans (5.59 vs. 5.08 at baseline; 6.07 vs. 4.62 at follow-up). In addition to the examination of the negative effect of parental HIV on children's mental health, previous studies have identified a number of other related factors that may contribute to poor mental health outcomes, including stigma, traumatic life events, and poverty.

Stigma and mental health

Parental HIV may cause unique challenges to children due to pervasive stigma associated with HIV (Mahajan et al., 2008; Rankin et al., 2005). HIV stigma refers to the prejudice, discounting, discrediting, and discrimination towards people living with HIV (PLWH) as well as the individuals, groups, and communities they associate with (Herek, 2002). HIV stigma remains persistent and prevalent worldwide (Nachega et al., 2012). Compared to people living with other chronic conditions such as cancer, PLWH are more likely to be stigmatized primarily due to the persistent misconceptions of how HIV is transmitted, the fear of being infected, and the negative attitudes towards some behaviors that are associated with increased HIV risk such as male-to-male sexual contact and injection drug use (Parker and Aggleton, 2003; Rankin et al., 2005; Earnshaw and Chaudoir, 2009).

Empirical studies have shown that not only PLWH are commonly stigmatized, but also children affected by parental HIV are the targets of stigma (Bogart et al., 2008). Nyamukapa et al. (2010) documented that AIDS orphans in eastern Zimbabwe were five

times more likely to experience stigma than children from HIV-unaffected families. Stigma has been associated with a variety of adverse outcomes, including depression, anxiety, loneliness, and psychosomatic symptoms (Lin et al., 2010; Cluver and Orkin, 2009; Wei et al., 2016a).

HIV stigma can also manifest in different forms, including internalized stigma (i.e., internalized negative attitudes towards HIV) and enacted stigma (i.e., the actual experience of stigmatization and discrimination) among children affected by parental HIV (Zhao et al., 2010). It has been suggested that children may internalize people's negative views and attitudes towards them (Bogart et al., 2008), and subsequently experience feelings of shame, guilt, dirtiness, and worthlessness, as well as avoiding social interactions, all of which contribute to increased psychological distress (Doku, 2012). Children affected by parental HIV may also be frequently bullied, such as name-calling (Cluver and Orkin, 2009; Boyes and Cluver, 2015). A comparison between children affected by parental HIV and their counterparts from HIV-unaffected families in South Africa found a much higher prevalence of bullying among children affected by parental HIV (Boyes and Cluver, 2015). In the same study, being the target of bullying was found to predict depressive symptoms one year later. Similar results regarding the association between being bullied and depressive symptoms were also documented among children affected by parental HIV in China (Jiang et al., 2019).

Traumatic life events and mental health

In addition to HIV stigma, children affected by parental HIV may be more likely to experience other HIV-related traumatic life events, such as change of caregivers, sibling separation, abuse, violence exposure, parental distress and depression, parental divorce,

death of family members, and inadequate care (Chi and Li, 2013). In China, compared to children from HIV-unaffected families, children affected by parental HIV reported higher occurrence rates of sickness and death of family members, parental separation or divorce, being taken away from family, sexual abuse, being hurt, and being robbed (Li et al., 2009). The same study further indicated that these traumatic life events had longer and more significant emotional impacts among children affected by parental HIV.

A case study in Uganda showed that AIDS orphans in foster homes were more likely to be treated violently by the guardians and experience neglect and sexual abuse than other children within the same family (McGaw and Wameyo, 2005). These children explained that the guardians' anger and frustration about having to take care of them when resources were limited and a lack of parental care and protection contributed to this elevated risk of experiencing violence, neglect, and sexual abuse (McGaw and Wameyo, 2005). A study in South Africa also showed similar results, with AIDS orphans and children of caregivers living with HIV reporting higher prevalences of physical abuse (12% vs. 6%), emotional abuse (23% vs. 7%), and transactional sex (18% vs. 6% for girls; 11% vs. 5% for boys) than children orphaned by other causes (Cluver et al., 2011). In addition, AIDS orphans and those living with HIV positive caregivers were also more likely to experience increased caregiver depression than those from HIV-unaffected families (Lachman et al., 2014; Sherr et al., 2016). All these types of traumatic life events, in turn, have been identified as risk factors for a variety of poor mental health outcomes, including depression, anxiety, and loneliness among children affected by parental HIV (Li et al., 2009; Sherr et al., 2016; Murphy et al., 2009b; Chi et al., 2015a; Wang et al., 2012).

Poverty and mental health

Because HIV disproportionately impacts people living in poverty as well as in low-income regions, children affected by parental HIV are also at elevated risk of experiencing poverty and deprivation (Piot et al., 2007). HIV infection, as suggested by Cohen (2002), could be both a consequence and a cause of poverty. Poverty has been linked to an increased risk of HIV infection, largely through the channel of adopting high-risk behaviors (Gillespie et al., 2007), including transactional sex and unprotected sex behaviors (Dinkelman et al., 2007; Byron et al., 2006). The diagnosis of HIV in a family may, in turn, exacerbate poverty due to the potential loss of family labor (Piot et al., 2007). Delva and colleagues (2009) found that AIDS orphans in Guinea are 3.04 times more likely to engage in economic activities including working as farmers and domestic workers and 2.73 times more likely to experience hunger on a daily basis than children orphaned by other parental illnesses. Similarly, AIDS orphans in China were more likely to worry about economic support and had less pocket money than non-orphans (He and Ji, 2007). In South Africa, AIDS orphans reported much lower scores on school access, food security, employment in the household, and welfare grant access than other-orphans or non-orphans (Cluver et al., 2009b). Poverty, in turn, was found to be associated with depression and anxiety among children affected by parental HIV (Cluver and Orkin, 2009; Cluver et al., 2009b).

In summary, children affected by parental HIV face a constellation of risk factors across multiple levels (e.g., individual, family, community), which in turn put them at increased risk of experiencing poor mental health outcomes. Such vulnerability driven by

the complex adversity calls for interventions that facilitate changes at multiple ecological systems to improve mental health for this group.

2.3. Resilience

It is well recognized that some children not only survive but also thrive in the face of adversity (Masten et al., 1990; Luthar and Cicchetti, 2000; Li et al., 2015; Masten and Barnes, 2018; Zolkoski and Bullock, 2012). This phenomenon is conceptualized within the conceptual framework of resilience. The resilience framework provides an alternative to deficit-focused models for understanding how children may respond to adversity and shifts the focus of research away from the sole evaluation of negative outcomes to opportunities to promote positive adaptation (Masten, 2001).

Resilience has been defined in different ways. Broadly, it has been conceptualized as a trait, a process, or an outcome (Southwick et al., 2014; Hu et al., 2015). A trait-oriented definition conceptualizes resilience as a personality trait or a skill that enables an individual to successfully cope with adversity (e.g., Wagnild and Young, 1993; Connor and Davidson, 2003). A process-oriented definition views resilience as a dynamic process that encompasses "positive adaptation within the context of significant adversity" (Luthar et al., 2000: p. 453). An outcome-oriented definition emphasizes the adaptive outcomes in the face of adversity (Masten, 2001). The current research adopts the definition of Luthar et al. (2000), with resilience being defined as a process of positive adaptation despite adversity.

According to Luthar and colleagues (2000), the conceptualization of resilience has two implicit conditions: one is the exposure to significant adversity, and the other one is the achievement of positive adaptation despite adversity. Luthar (2015) further suggests

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that resilience may not be measured directly; instead, it is inferred indirectly based on the evidence on these two implicit conditions. Adversity refers to a high-risk condition that is statistically associated with higher odds of poor outcomes (Masten, 2001). For example, exposure to parental HIV is considered as a high-risk condition, given that children affected by parental HIV exhibit significantly poorer mental health than those from HIV-unaffected families (Chi and Li, 2013).

Regarding positive adaptation, it can be conceptualized as (1) the development of age-appropriate competence and (2) achieving successful outcomes in key domains that highly relevant to the examined risk (Masten, 2001; Luthar, 2015). Under the first situation, for example, among school-aged children, competence can be characterized as maintaining school functioning such as good school adjustment, academic achievement, and positive peer relationships (Masten and Coatsworth, 1998). Under the second situation, taking parental HIV as an example, according to Luthar (2015), it would be appropriate to operationalize positive adaptation as an absence of clinically significant mental health symptoms, given that parental HIV is a salient risk factor for poor mental health. Positive adaptation, however, is not fixed. That is, children may manifest new strengths and vulnerabilities following the changes in life circumstances as they age (Luthar, 2015).

Research on resilience has advanced in four waves over the past 50 years (Wright et al., 2013; Masten, 2018). The first wave of research focuses on identifying the factors associating with positive adaptation for children experiencing adversity, with a particular interest on two types of factors: positive factors and protective factors. Positive factors, also termed as assets, compensatory factors, or promotive factors, refer to factors

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contributing to positive outcomes regardless of the levels of risk exposure, whereas protective factors refer to factors associating with positive adaptation when risk is high (Wright et al., 2013; Masten, 2018; Luthar et al., 2000). The second wave of research adopts a developmental and ecological perspective, with a focus on understanding the complex mediating and moderating process in shaping positive adaptation in the context of adversity.

The third wave of research, beginning in the 1990s, emphasizes resilience promotion by translating the findings from the previous two waves of research into action. Research from the third wave underscores the importance of developing theory-driven, culturally-tailored, multi-domain interventions to achieve positive outcomes, given that many children do not experience a single risk factor but rather multiple and intersecting risks (Wright et al., 2013). The fourth wave of research emerges from advances in genetics and neuroscience in the 2000s, and research in this line focuses on understanding resilience at multiple levels, including genes, neurobiology, brain development, behavior, and context (Masten, 2007; Wright et al., 2013).

2.4. Resilience and Mental Health in Children Affected by Parental HIV

Despite the risk associated with parental HIV, some children manifest positive adaptation in terms of mental health, displaying an absence of clinically significant or prolonged, elevated levels of mental health symptoms (Chi et al., 2014; Lester et al., 2006). A longitudinal study among adolescents of parents living with HIV found that about 55.5% of adolescents were not diagnosed with any lifetime depressive or anxiety disorders over four years (Lester et al., 2006). An overall decrease in mental health symptoms was also observed in children affected by parental HIV, suggesting that at least

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some of these children did not experience high levels of mental health symptoms over time (Chi et al., 2014; Rotheram-Borus et al., 2005; Murphy et al., 2006). Furthermore, by reviewing evidence from studies focusing on adversities that were similar to risks being experienced by children affected by parental HIV, including parental death, poor parental mental health, divorce, violence exposure, and undernutrition, Stein et al. (2014) concluded that the majority of children did not experience long-term maladjustment regardless of the type of adversity.

Resilience research for children affected by parental HIV has grown over the past 20 years, with the majority of the work characterized by the first three waves of resilience research. This section primarily presents some observational studies with a focus on identifying factors and processes regarding better mental health, and the following section discusses the interventions for resilience promotion among children affected by parental HIV.

Studies have identified several factors at the individual, family, and community levels that contribute to better mental health among children affected by parental HIV (Betancourt et al., 2013). At the individual level, some positive internal assets, including coping skills, emotional regulation, self-esteem, perseverance, and future orientation, have been identified as important factors in facilitating better mental health (Zhang et al., 2009; Murphy and Marelich, 2008; Du et al., 2015; Betancourt et al., 2011; Zhao et al., 2014). For example, higher self-esteem and future orientation (measured by future expectation, hopefulness, and control over the future) were found to be cross-sectionally associated with less depressive symptoms among children affected by parental HIV in China (Zhao et al., 2014). In the same study, self-esteem, hopefulness, and control over

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the future also predicted depressive symptoms at first-year follow-up, whereas these observed effects became nonsignificant at the second-year follow-up.

At the family level, the strong caregiver-child relationship has been found to be associated with less depressive symptoms and anxiety among children (Wang et al., 2012; Forehand et al., 2002; LeCroix et al., 2019). Positive parenting practices also have been linked to lower levels of depressive symptoms, anxiety, and loneliness (Chi et al., 2015a; Murphy et al., 2009b; Tompkins and Wyatt, 2008). For example, in a study of children living with HIV positive mothers in the United States, more family routines and parenting monitoring were associated with a faster decline in depression and anxiety over 30 months (Murphy et al., 2009b). At the community level, social support has been increasingly examined as a positive or protective factor for better mental health among children affected by parental HIV (Hong et al., 2010; Betancourt et al., 2011; Cluver et al., 2009a; Lee et al., 2007). For example, Hong et al. (2010) found that perceived social support had a direct impact on depressive symptoms and loneliness among children affected by parental HIV in China. In the study of Cluver et al. (2009a), perceived social support buffered the adverse effect of trauma exposure on posttraumatic stress among AIDS orphans in South Africa, showing that trauma exposure was less strongly associated with posttraumatic stress when perceived social support was high, compared to when perceived social support was low.

A few studies have also examined the complex process that impacts mental health for HIV-affected youths (Steele et al., 1997; Wang et al., 2012; Murphy et al., 2009a; Casale et al., 2015). For example, a cross-sectional study showed that there was a dynamic interplay between future orientation, trusting relationship with caregivers, and perceived

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social support in mitigating the adverse impact of HIV stigma on depressive symptoms among children affected by parental HIV in China (Wang et al., 2012). Similarly, in the study of Murphy et al. (2009a), children's self-concept, family cohesion, and maternal physical functioning were found to work as serial mediators in linking maternal CD4 count (i.e., a measure of immune function) and HIV disclosure to children's depressive symptoms over 84 months.

Recently, building upon the perspectives from the social-ecological model (Bronfenbrenner, 1979) and resilience theory, a conceptual framework of psychological resilience has been developed for children affected by parental HIV (see Figure 2.1, Li et al., 2015). This proposed framework illustrated the dynamic resilience process in shaping positive adaptation in children who experienced parental HIV and associated risk factors. Li and colleagues (2015) suggested that resilience resulted from the interplay of multiple factors within and across three ecological systems: internal assets, family resources, and community resources. The authors further hypothesized that family and community resources would enhance internal assets, and internal assets, in turn, would contribute to better usage of family and community resources. Internal assets and family and community resources, together, would play a critical role in influencing positive outcomes, including better mental health. Several specific resilience factors from the three ecological systems were proposed in this framework, with many overlapping with the factors identified from the above empirical resilience research for this group. Specifically, internal assets included coping skills, motivation to adapt, religious and spiritual beliefs, and personality (e.g., emotional stability, extroversion). Family resources included smooth transitions, functional caregivers, securely attached

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relationships, and effective parenting discipline. Finally, community resources included social support from peers, teachers, and other mentors, as well as effective schools and supportive communities.

2.5. Resilience-based Psychosocial Interventions for Children Affected by Parental HIV

The psychosocial intervention has been defined as "interpersonal or informational activities, techniques, or strategies that target biological, behavioral, cognitive, emotional, interpersonal, social, or environmental factors to improve health functioning and well-being" (England et al., 2015: p. 31). According to this definition, psychosocial interventions consist of three components: the actions, the mechanisms of change, and the outcomes (England et al., 2015). The actions are referred to as the ways or methods regarding the components of the intervention and how the intervention is delivered; the mechanisms of change are the "changes in biological, behavioral, cognitive, emotional, interpersonal, social, or environmental factors" that lead to the intervention outcomes (England et al., 2015: p. 32), and the outcomes are desired changes of the intervention. By integrating the definitions of resilience (Luthar et al., 2000), a resilience-based conceptual framework (Li et al., 2015), and the psychosocial intervention (England et al., 2015), the term resilience-based psychosocial intervention, in this research, refers to the interpersonal or informational practices that target the building of skills, capacities, and resources at one or multiple ecological systems with the aim of facilitating positive developmental outcomes.

A few resilience-based interventions have been developed and have shown benefits for mental health of children affected by parental HIV, whereas mixed findings have emerged. In a recent systematic review of literature on interventions for HIV-affected

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children, Skeen et al. (2017) identified 17 intervention studies, with six resilience-based interventions targeting mental health outcomes, including depressive symptoms, anxiety, anger, and internalizing behaviors. Of the six studies, two found significant improvements in mental health outcomes, and four found null intervention effects or even negative impacts.

Specifically, Thurman et al. (2012), using a post-test design, found that children in Kenya whose families participated in the Catholic Relief Services support group reported less emotional symptoms than children whose families did not participate in. Similarly, Kumakech et al. (2009) conducted a cluster RCT to examine the efficacy of a peer-support intervention targeting coping strategies in improving mental health outcomes among AIDS orphans in Uganda. The authors found that the intervention group reported significantly less depression, anxiety, and anger, compared to the control group at the 10-week follow-up.

Among the four studies indicating null or mixed findings, Eloff et al. (2014) adopted an RCT and found that a family-based intervention with a focus on HIV-related issues, parenting, and children's self-esteem and interpersonal skills did not decrease depression over an 18-month period among children affected by parental HIV in South Africa. In the same study, the authors found that anxiety in the intervention group was increased at 6 months, but this increase did not persist at 12 and 18 months. Another family-based intervention also did not yield positive effects in anxiety reduction over 10 weeks for participating children living in highly HIV-affected communities in South Africa (Bell et al., 2008).

Rotheram-Borus et al. (2012) used an RCT to evaluate the efficacy of a family-based intervention for HIV positive mothers and their children in the United States. This intervention involved 8-week group sessions for mothers and their children with a focus on family-related issues, such as parenting and building a positive family environment. The results indicated that children in the intervention and control groups had similar declines in internalizing behaviors over 18 months. Also, a quasi-experimental study for a community-based intervention that aimed to increase self-esteem and self-efficacy found no intervention effects in significantly decreasing depression among children affected by parental HIV in South Africa (Mueller et al., 2011)

More recently, a few evaluations of resilience-based interventions have been published since the Skeen et al. (2017) review. A pilot RCT for children of caregivers living with HIV in Rwanda found that a family-based intervention significantly reduced depressive symptoms at 3-month follow-up (Betancourt et al., 2017). The components of this family-based intervention consisted of psychoeducation about HIV and skills development, including parenting, communication, stress management, the development of a family strengths-based narrative, and problem-solving skills. Another pilot RCT of a family-based intervention indicated that the intervention reduced depressive symptoms at 12-month follow-up among children of mothers living with HIV in the United States (Murphy et al., 2017). In the study, the intervention primarily focused on enhancing parenting and self-care behaviors for HIV-positive mothers of children.

These studies provide mixed support for the effectiveness of resilience-based interventions on mental health for children affected by parental HIV, and research in this line is still limited. There is a lack of psychosocial interventions targeting multilevel

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ecological systems to enhance resilience and ultimately to promote mental health, and data regarding the efficacy of such interventions are limited. Also, the majority of previous studies examined the intervention effects in a relatively short follow-up period; it is less understood whether the effect of a resilience-based intervention on mental health outcomes could be sustained over a longer period.

2.6. Moderators and Mediators of Intervention Effects

To date, intervention studies among children affected by parental HIV are primarily focused on testing the efficacy or effectiveness of the interventions on desired outcomes. However, as the literature in this line grows, there is a need to move forward to explore some other questions. Two important questions are: "for whom or under which situation does an intervention work," and "how does an intervention work" (MacKinnon, 2011; Breitborde et al., 2010). The first question attempts to identify the subgroups that are more responsive to the intervention using moderation analyses, and the second question focuses on understanding the mechanisms through which an intervention works using mediation analyses.

Moderators and mediators serve as the building blocks for theory (Rothman, 2013). They are both commonly treated as the third variable in the relationship between two variables, but moderators and mediators differ conceptually and statistically (MacKinnon, 2011; Baron and Kenny, 1986). A moderator is a third variable that affects the form or direction of the relationship between an independent variable and a dependent variable (Baron and Kenny, 1986). Moderation effects can be examined by testing the statistical significance of the interaction term between the moderator and the independent variable in the regression analysis (MacKinnon, 2011; Baron and Kenny, 1986). A mediator refers

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to a third intermediate variable linking an independent variable to a dependent variable. Therefore, a mediator is a part of a causal sequence that the independent variable causes the mediator, and the mediator, in turn, causes the dependent variable (MacKinnon, 2011; Baron and Kenny, 1986). Multiple methods have been developed to test the mediation effect, including the causal steps outlined by Baron and Kenny (1986), the differences in coefficients of the relationship between the independent and dependent variables before and after including the mediator (e.g., Clogg et al., 1992), and the product of coefficients test outlined by MacKinnon et al. (2002).

Understanding "for whom or under which situation" and "how" an intervention works is critical in multiple ways. First, identifying "for whom or under which situation" takes intervention research a step further to explore whether the effectiveness of an intervention may vary depending on individual and contextual factors. The results from moderation analyses, for example, may provide information to suggest which subgroups of the targeted population are likely to be more responsive to the intervention, and therefore, can help researchers and clinicians make more appropriate decisions regarding intervention selection and implementation (Kraemer et al., 2002). Also, testing contextual factors as moderators provide useful data on whether an intervention would be more effective under specific characteristics of the environment and can help researchers and implementers infer whether similar interventions may work in other contextual settings.

Second, examining "how" an intervention works through the mediation analysis moves beyond the descriptive research on the effectiveness of an intervention to the identification of the processes and mechanisms leading to the intervention effects (Hinshaw, 2007). Theoretically, it provides an opportunity to elucidate the process

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through which a resilience-based intervention works and therefore, facilitate the understanding of the resilience process. Practically, it can help to identify the "active ingredients" of the intervention, which in turn help to develop more efficacious interventions by focusing on active elements and eliminating unimportant ones (Lubans et al., 2008; MacKinnon and Luecken, 2008). Developing more efficacious interventions might be particularly critical for children affected by parental HIV, given that a majority of this group live in low- and middle-income countries (UNICEF, 2017). Furthermore, mediation analyses can provide important implications when intervention effects are absent (O'Rourke and MacKinnon, 2018). Testing the mediators can help to identify the source of a lack of intervention effects. For example, mediation analyses could reveal that a lack of intervention effects was due to no changes in mechanistic factors. Conversely, mediation could indicate that an unsound theoretical framework had been employed if there were changes in proposed mechanistic factors but did not translate to the intended intervention benefits (O'Rourke and MacKinnon, 2018; Cleary and Stanton, 2015). Therefore, the results from the mediation analyses can provide valuable recommendations for future intervention refinement.

Identifying moderators in intervention research could be predetermined before a study design to test a hypothesis or examined after a study to explore differences in intervention effects across subgroups (MacKinnon, 2011). Moderators that are commonly examined in intervention studies include individual characteristics, such as gender and age, contextual characteristics, such as family context and school environment, and baseline characteristics of the outcomes (MacKinnon, 2011; England et al., 2015). However, mediation evaluation in an intervention study is often prespecified according to

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the conceptual framework on which the intervention is developed and therefore is commonly used as a critical step to investigate the mechanisms of change underlying an intervention (Fairchild and MacKinnon, 2009). For example, in a parenting intervention for mental health in children, changes in parenting practices, as a predetermined intervening variable, is anticipated to be a potential mediator underlying the intervention effects on mental health. Given the particular interest of the current research, a review was presented below, with a focus on gender and age as two possible moderators and emotional regulation and coping as two possible mediators underlying changes in mental health in resilience-based interventions. The review expanded to studies in other groups of children due to lack of relevant studies among children affected by parental HIV.

Gender and age as moderators

Gender and age are two individual factors that have been examined as moderators underlying the effects of resilience-based interventions on mental health in children. A recent systematic review suggested that previous studies were inconclusive regarding gender differences in resilience-based intervention effects for mental health outcomes (Dray et al., 2017). In this review, among 18 studies examining gender differences in intervention effects on the reduction of depressive symptoms, 15 found no gender differences, and three demonstrated different patterns of significant intervention effects by gender; among 10 studies focused on anxiety, eight studies found no gender differences, whereas two studies found that girls benefited more from the intervention than boys. This review further indicated that although many studies found null gender differences, testing intervention effects by gender was needed for future studies since less than half of the included studies in the review examined intervention effects by gender. A

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few studies have also examined possible moderation effects of gender in the intervention effects for mental health among children affected by parental HIV. Eloff et al. (2014) found that a resilience-based intervention with a focus on parenting enhancement resulted in more reductions in depressive symptoms for boys in the intervention group than boys in the control group, whereas girls in both groups showed similar improvements. In another study, however, Kumakech et al. (2009) found that gender did not moderate the effects of a peer-group support intervention on depressive symptoms, anxiety, or anger.

Several possible explanations have been suggested to explain potential gender differences in the intervention effects for mental health outcomes. One explanation is the gender difference in mental health outcomes. For example, adolescent girls in the United States has been documented to be at higher risk of experiencing some poor mental health outcomes than boys, including depressive symptoms (Vaughan and Halpern, 2010). Girls, therefore, may be more motivated to engage in the intervention and have more room for improvements (Stice and Shaw, 2004). Also, some researchers have suggested that girls are more self-discipline and mastery-oriented than boys, which may contribute to a better mastery of knowledge and skills taught by the intervention (Pössel et al., 2011). This explanation has been supported by an RCT of a school-based psychosocial intervention for adolescents (Pössel et al., 2011). In this study, girls were found to report more knowledge about the intervention content than boys, and the interaction effect of gender and the intervention on depressive symptoms was decreased after controlling for the knowledge of the intervention content. Another possible explanation is the gender difference regarding the effects of resilience-related factors on mental health. Some studies have demonstrated that the benefits of some positive factors on decreased

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depressive symptoms are particularly salient for one gender (Bond et al., 2005; Cupito et al., 2015; Rodríguez-Naranjo and Caño, 2016). For example, interpersonal relationships such as attachment and social skills were found to be more robustly associated with less depressive symptoms in girls than in boys (Bond et al., 2005). Therefore, gender differences may be likely to emerge in the interventions with a focus on these gender-varying factors.

In the review of Dray et al. (2017), resilience-based interventions were found to reduce anxiety symptoms for children 5-10 years of age, but not for children 11-18 years of age; there were no age differences in the intervention effects for depressive symptoms. In intervention studies among children affected by parental HIV, Eloff et al. (2014) did not observe a moderation effect of age on the intervention effects for mental health outcomes among children 6-10 years of age. Kumakech et al. (2009) also showed no age differences in the intervention effects among children 10-15 years of age. However, the lack of age differences in these two studies may be due to the relatively small age range of children in each study. In a recent study among children affected by parental HIV with a broader age range, the resilience-based intervention was found more beneficial for children 13-18 years of age than those 6-12 years of age regarding the intervention effects on reducing behavioral problems (Li et al., 2017a).

The age differences documented in resilience-based intervention studies can be possibly explained by variation in specific positive or protective factors across life stage (Dray et al., 2017). For example, although parenting is critical for children of different ages, it may be particularly salient for younger children. A meta-analysis of the effectiveness of the Triple P-Positive Parenting Program, a behavioral parenting

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intervention, found that younger children gained significantly greater benefits from the program than older ones regarding the measured outcomes such as depression (Nowak and Heinrichs, 2008). The observed differences in intervention effects by age may also be due to developmental differences in children's ability to understand the intervention content (Stice et al., 2009; Li et al., 2017a). For example, older children might have a better understanding of the content of psychosocial interventions due to more mature cognitive skills, compared to younger children (Burnett and Blakemore, 2009).

Emotional regulation and coping as mediators

Emotional regulation and coping have been suggested as two central factors for facilitating resilience and reducing the risk of poor mental health in childhood and adolescence (Compas et al., 2017; Troy and Mauss, 2011). Emotional regulation and coping are also identified as important internal assets contributing to resilience among children affected by parental HIV (Li et al., 2015; Betancourt et al., 2013). Emotional regulation, adopting the definition from Salovey and Mayer (1990), is conceptualized as the ability to modulate emotional responses and intensity in oneself and in response to others. It is suggested that children with high emotional regulation ability can regulate emotional reactions to stressors in a socially acceptable and flexible way, which in turn decreases the risk of experiencing negative emotions (Kim and Cicchetti, 2010). Children with deficits in emotional regulation, however, may lack the ability to engage in goal-directed behaviors when stressed, show excessive emotional reactivity, and express emotions in a contextually inappropriate way, putting them at increased risk of experiencing prolonged negative emotions (Kim and Cicchetti, 2010; Salters-Pedneault et al., 2006).

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A few studies have indicated that emotional regulation may be a potential intervening factor for mental health in children facing adversity. Using the baseline data from the ChildCARE intervention evaluation, Wei et al. (2016b) found that emotional regulation mediated the association between stigma and posttraumatic growth among children affected by parental HIV. Another study (Jiang et al., 2018), using the same dataset, also found that emotional regulation might act as one of the potential psychological mechanisms linking bullying to cortisol dysregulation, a biomarker that is associated with poor mental health outcomes (Adam et al., 2017). The potential mediation effects of emotional regulation were also observed in the effects of other stressors, such as maltreatment, maternal depression, and stressful life events, on mental health outcomes in children (Alink et al., 2009; McLaughlin and Hatzenbuehler, 2009; Kim and Cicchetti, 2010; Kam et al., 2011). Furthermore, a few studies examined the mediating role of emotional regulation in the effect of the psychosocial interventions on targeted outcomes (Bjureberg et al., 2017). For example, Bjureberg et al. (2017) found that reductions in emotional regulation difficulties mediated the effects of an individual emotional regulation therapy on children's nonsuicidal self-injury.

Coping, a somewhat overlapping but different construct from emotional regulation, is another possible intervening factor for mental health in children. Coping, in the present research, is defined as "the thoughts and behaviors used to manage the internal and external demands of situations that are appraised as stressful" (Folkman and Moskowitz, 2004: p 745). According to Compas et al. (2014), coping is a broader concept that includes a more extensive array of regulatory efforts than emotional regulation. However, coping is also more specifically related to regulatory efforts under stress, compared to

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emotional regulation that encompasses emotional events in both stressful and non-stressful situations (Compas et al., 2014).

The study of coping has been focused on the strategies of how individuals react to and deal with the stressors (Skinner and Zimmer-Gembeck, 2010). Two common types of coping strategies are problem-focused coping and emotion-focused coping (Baker and Berenbaum, 2007; Lazarus and Folkman, 1984; Zimmer-Gembeck and Skinner, 2016). Problem-focused coping commonly refers to active efforts to confront or modify the sources of stress, such as problem-solving, whereas emotion-focused coping refers to efforts to manage emotional responses to stressful situations, such as social withdrawal (Zimmer-Gembeck and Skinner, 2016). Coping strategies are not stable. Individuals may modify their coping strategies depending on the internal resources and the context's demands (i.e., coping flexibility, Heffer and Willoughby, 2017).

Specific coping strategies may be adaptive or maladaptive regarding their effects on developmental outcomes (Compas et al., 2017). In the present research, adaptive coping, or positive coping, refers to coping strategies that may be associated with better mental health, whereas maladaptive coping, or negative coping, refers to strategies that may be associated with poorer mental health in children. Evidence from a recent meta-analysis showed that the broad domain of positive coping was consistently associated with fewer externalizing behaviors, whereas the broad domain of negative coping was consistently associated with more severe internalizing symptoms (Compas et al., 2017). Studies among children affected by parental HIV also showed that positive coping measured by a combined index of problem-solving, cognitive reframing, and emotion management was associated with a healthier diurnal cortisol pattern, whereas negative coping measured by

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a range of acting out behaviors was independently associated with a less healthy diurnal cortisol pattern among children affected by parental HIV (Slatcher et al., 2015).

The potential impact of coping on mental health outcomes has also been observed in some intervention studies among children facing other adversities (Compas et al., 2010; Spence et al., 2003; Tein et al., 2006). In an RCT for children living with depressed parents (Compas et al., 2010), the authors found that changes in positive coping (e.g., acceptance, positive thinking) significantly mediated the effects of a family-based cognitive-behavioral intervention on depression. Similarly, Spence et al. (2003) found that problem-solving strategy worked as a mediator underlying the effect of a coping-focused intervention on changes in depression between pre- and post-intervention. In addition, Tein et al. (2006) found that increases in positive coping strategies at 11-month follow-up significantly mediated the effect of a family bereavement program on decreased symptoms of depression and anxiety among bereaved children.

2.7. Summary

Children affected by parental HIV are at elevated risk of experiencing poor mental health outcomes due to the multiple complex challenges they experience (Chi and Li, 2013; Islam et al., 2015; Sharp et al., 2015). Despite the adversity, some of these children exhibit resilience, and previous research in this group shows the potential benefit of resilience-based psychosocial interventions for mental health improvement (Betancourt et al., 2013; Li et al., 2015). Indeed, a few pioneering interventions have been developed for children affected by parental HIV (Rotheram-Borus et al., 2001; Mueller et al., 2011; Kumakech et al., 2009; Eloff et al., 2014; Thurman et al., 2012). However, intervention research for this group is still limited. There is a lack of psychosocial interventions

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targeting multilevel ecological systems (e.g., child, family, community) to promote resilience, and evaluations of the effectiveness of such interventions on mental health outcomes have yielded mixed results. Besides, many existing intervention studies have only evaluated the intervention effects with a short follow-up period; there is a need to examine whether resilience-based interventions can result in longer-term sustained effects. Lastly, few studies have examined the potential moderators and mediators underlying the intervention effects for mental health among children affected by parental HIV. Examining for whom or under which conditions an intervention may work, as well as how an intervention works are critical for understanding the resilience process and developing effective and efficacious interventions in the future.

The overall objective of this research was to evaluate the efficacy of the ChildCARE intervention on mental health outcomes for children affected by parental HIV and to examine the potential moderators and mediators underlying the intervention effects.

Specific Aim 1: To test the short-term efficacy of the ChildCARE intervention on selected mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness), as well as the potential moderators underlying the intervention effects, among children affected by parental HIV.

Research Question 1a: What are the impacts of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness at 6, 12, and 18 months?

Research Question 1b: Are there any additive effects of the ChildCARE intervention components on mental health outcomes for children who received more than one intervention component (i.e., child + caregiver, child + caregiver + community)?

Research Question 1c: Do some key demographic variables (i.e., gender, age) moderate the intervention effects for mental health outcomes?

Specific Aim 2: To examine the efficacy of the ChildCARE intervention on mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness) beyond the 18 months of follow-up and to identify the potential mechanism of change through which the ChildCARE intervention works.

Research Question 2a: What are the impacts of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness beyond 18 months of follow-up (i.e., 24 months, 30 months, 36 months)?

Research Question 2b: Would emotional regulation and coping mediate the effects of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness?
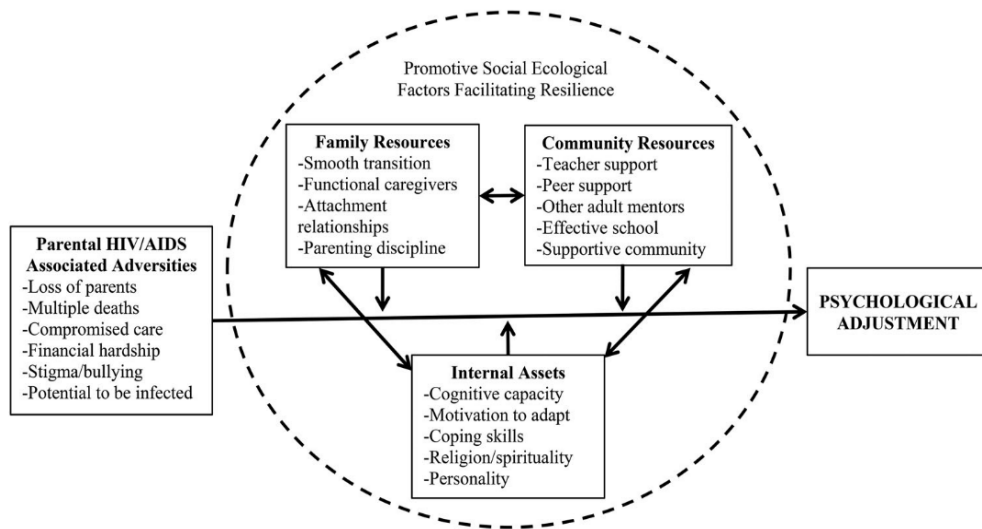
Figure 2.1. The conceptual framework of psychological resilience for children affected by parental HIV (reproduced from Li et al., 2015).

Chapter 3

Methodology

3.1. Overview

The current research aimed to evaluate the efficacy of the ChildCARE intervention on selected mental health outcomes and to examine the potential moderators and mediators underlying the intervention effects among children affected by parental HIV. The implementation and evaluation of the ChildCARE intervention were led by Dr. Xiaoming Li, using a 4-arm community-based cluster RCT from 2012 to 2016 in central China (Li et al., 2017b).

3.2. The ChildCARE Intervention

The ChildCARE intervention was developed upon the conceptual framework presented in Chapter 2 (Li et al., 2015), with the goal of improving resilience and facilitating positive outcomes for children affected by parental HIV in Henan, China. The ChildCARE intervention consisted of three components: child peer-group activities, caregiver parenting training, and community advocacy. At the child level, children participated in ten 2-hour peer-group activities that aimed to develop multiple intra- and inter-personal skills, such as emotional regulation, coping, positive thinking, and problem-solving. At the caregiver level, the caregivers of children participated in five 2-hour interactive parenting training modules that aimed to develop positive parenting skills such as positive discipline strategies and self-care. At the community level, children and caregivers received the community advocacy services that were delivered by

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intervention facilitators. The advocacy consisted of monthly home visits and a series of community-based activities that aimed to promote cohesion and strengthen local communities. Appendix A displayed the session topics included in the child and caregiver intervention components. In previous reports of the efficacy of the ChildCARE intervention, improvements have been demonstrated in children's internal resilience resources (Li et al., 2017b) and school outcomes (Harrison et al., 2017; Harrison et al., 2018), as well as caregivers' mental health and parenting (Harrison et al., 2019).

3.3. Research Settings, Participants, and Procedure

Settings

The ChildCARE intervention was implemented in a rural county in Henan Province. Henan is an agricultural province located in central China, with a population of about 100 million by the end of 2015, according to Henan Province Bureau of Statistics (2016). In the 1990s, HIV spread rapidly in Henan Province through unhygienic blood collection practices (Zhao et al., 2009; Deng et al., 2008). Thousands of donors were infected with HIV, and more than 2,000 children lost one or both of their parents to AIDS-related illness (UNICEF, 2007). In the past two decades, several efforts have been made to combat HIV in China. In 1998, China established the Blood Donation Law banning the paid blood donation, as well as encouraging voluntary blood donation. In 2003, China initiated the "four frees and one care" policy: "free antiretroviral drugs, free voluntary HIV counseling and testing, free prevention of mother to child transmission, free schooling for AIDS orphans, and care for AIDS patients and their families" (Population Reference Bureau, 2005: p. 13). In 2004, with the funding from the central and local government, Henan Province began to provide the institutional living assistance for AIDS

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orphans and built 21 orphanages called "Sunshine Home" (UNAIDS, 2015). In 2005, 44 "Sunshine Families" were newly constructed in Henan. At present, the majority of these orphanages were closed, and AIDS orphans in Henan are relocated according to the established policies of adoption, family foster care, and centralized support (UNAIDS, 2015).

The rural county, where the intervention was implemented, is in the south of Henan Province, which administers 22 townships and 460 administrative villages and has a population of about 1.51 million. This county was one of the HIV epicenters in the 1990s in Henan Province. A study of the mortality rate from 1995 to 2007 among seven administrative villages in this county indicated that AIDS-related death was a driver of the increased mortality rate from 1995 (0.7%) to 2002 (1.49%), particularly among adults 20-49 years of age (Li et al., 2010a). This study showed that of all deaths, the percentage of deaths among those 20-49 years of age was less than 20% from 1995 to 1997, but increased to 27.4% in 1998, and reached to 49.2% in 2001; of deaths among this age group, AIDS-related deaths accounted for 63.9% of all deaths.

Recruitment procedure and participants

Children and their caregivers (as dyads) were recruited from five villages in the targeted county, with the assistance of local schools and social welfare systems (Chi et al., 2015b). First, the villages with the highest rates of HIV infection in the targeted county were identified through village-level HIV surveillance data. Second, the research team generated a list of families caring for children affected by parental HIV for each selected village. Third, the research team randomly selected families on the list and invited one child and his/her primary caregiver to participate in the research. The

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eligibility criteria for children included: (1) between 6-17 years of age and (2) one or both biological parents were HIV positive (i.e., alive or deceased). If a family had multiple children met the inclusion criteria, one child was randomly selected. Children with known HIV infection (confirmed by caregivers or local community officials) were excluded from the research.

A total of 790 children and their caregivers participated in this research. Of the 790 children, 382 (48.4%) were girls, and 746 (94.4%) were between 8-15 years of age. About 12.4% ($n = 96$) of children were AIDS orphans, with 9.3% having lost one parent and 3.1% having lost both parents to AIDS-related illness; approximately 87.7% ($n = 680$) of children had one (72.6%) or both parents (15.1%) currently living with HIV. The average number of family members ever infected with HIV in the household was 1.07($SD = 1.01$), and the average number of AIDS-related death in the household was 0.45($SD = 0.78$). Of the caregivers, the average age was 42.7 years ($SD = 12.6$). About 54.4 % had less than secondary school education, and about 65.2% reported farming as their primary occupation. Over half (61.6%) of the caregivers reported that they were HIV positive, and 70.6% were children's biological parents. The cumulative attrition rate for children at each follow-up was: 5.4% at 6 months, 13.2% at 12 months, 15.9% at 18 months, 22.7% at 24 months, 24.8% at 30 months, and 39.0% at 36 months.

Intervention assignment and delivery

Child-caregiver dyads were clustered by the schools which the children were currently attending, resulting in a total of 45 clusters with an average of 17.5 dyads per cluster. The school clusters then served as the unit of randomization and were assigned to one of the four conditions: the child-only ($n = 200$ dyads), child + caregiver ($n = 198$

dyads), child + caregiver + community (*n* = 197 dyads), or control (*n* =195 dyads). Of the

four groups, the child-only group received child intervention component only; the child +

caregiver group received both child and caregiver intervention components; the child +

caregiver + community group received child, caregiver, and community intervention

components; and the control group did not receive any of the intervention components.

Due to resource constraints, the three components of the ChildCARE intervention (child,

caregiver, and community) were implemented on a staggered schedule. Specifically, the

child intervention component was delivered between baseline and 6 months, the caregiver

intervention component was delivered between 6 and 12 months, and the community

intervention component was delivered between 12 and 36 months (Harrison et al., 2017;

Li et al., 2017b). Table 3.1 presented the timeline for intervention delivery. In-person

training and the standardized intervention manual were provided to intervention

facilitators to increase intervention fidelity.

Data collection procedure

   Children were asked to complete a self-reported survey at the baseline and every six

months up to 36 months. The survey consisted of several demographic and psychosocial

scales in Chinese. For scales that were initially developed in English, a forward and

backward translation process was performed by English-Chinese bilingual research team

members (Fang et al., 2009). At each assessment, the paper-and-pencil survey was

completed individually or in small groups in the presence of two interviewers. For a

small number of young children with difficulties in reading (i.e., about 2%), the

interviewers read the items to them and recorded their oral responses on the survey in a

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private room. At the end of each assessment, each child received an age-appropriate gift (e.g., a toy or school-supply) as the token for appreciation.

Ethical consideration

Institutional Review Boards at Henan University in China and Wayne State University and the University of South Carolina in the United States approved the study protocol. All children and their caregivers provided appropriate informed consent before participation.

3.4. Measures and Statistical Analyses for Manuscript 1

The aim of this manuscript was twofold: (1) to examine the efficacy of the ChildCARE intervention on depressive symptoms, school anxiety, and loneliness at 6, 12, and 18 months and (2) to explore whether gender and age would moderate the effects of the ChildCARE intervention on mental health outcomes at each follow-up.

Measures

Mental health outcomes. Depressive symptoms were measured using the 10-item *Center for Epidemiological Studies Depression Scale for Children* (CES-DC, Fendrich et al., 1990; Andresen et al., 1994). School anxiety was measured using the 6-item anxiety/withdrawal subscale adapted from the *Child Rating Scale* (CRS, Hightower et al., 1987). Loneliness was measured using the 16-item *Loneliness Scale for Children* (Asher et al., 1984).

Demographic variables. Children were asked to report their gender, age, household composition (e.g., number of siblings), parents' education and occupation, and numbers of HIV infection and HIV-related death in the household.

Statistical analyses

Data analyses were performed using SPSS Version 25.0 for Windows (IBM Corp. Released 2017. Armonk, NY). The significance threshold was set at $p < .05$. Potential differences in baseline characteristics by intervention assignment were determined using analyses of variance (ANOVA) for continuous variables and the Chi-square test for categorical variables. ANOVA was also performed to test any statistically significant differences in baseline mental health outcomes between the intervention and control groups among children who lost to follow-up.

The linear mixed effects model was used to test the intervention effects. The linear mixed effects model was selected because it can account for the correlations among repeated measures, as well as the dependence between children within the school clustering (West, 2009). At each follow-up, linear mixed effects models were separately performed for each of the three mental health outcomes. Given the intervention implementation schedule, at 6 months, the effect of the child-only intervention condition was examined; 12 months, we had an opportunity to examine the effects of both the child-only and child + caregiver intervention conditions; at 18 months, the effects of all three intervention conditions were examined. The intervention effects at 6, 12, and 18 months were assessed by the interaction terms between the intervention conditions (e.g., child-only, child + caregiver, child + caregiver + community) and time (e.g., 6 months, 12 months, 18 months).

The linear mixed effects model outlined above was used to test gender and age differences in the intervention effects. The potential gender (or age) differences in the intervention effects were assessed by the three-way interaction terms among gender (or

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age), the intervention conditions, and time. Furthermore, to interpret the potentially significant gender and age differences in intervention effects, the analyses for linear mixed effects models were stratified by gender (i.e., boys, girls) and baseline age (i.e., below 12, 12 and above). Age 12 was chosen as the cutoff because it marks the developmental transition from primary school to secondary school among Chinese children (UNICEF, 2014). All models were performed using restricted maximum likelihood estimation (Gilmour et al., 1995).

3.5. Measures and Statistical Analyses for Manuscript 2

The aim of this manuscript was (1) to examine the effects of the ChildCARE intervention on mental health outcomes beyond 18 months of follow-up (2) to test the possible mediation roles of emotional regulation and coping in the effects of the ChildCARE intervention on mental health. Figure 3.1 presented the hypothesized mediation model. In the model, emotional regulation and coping assessed at 18 months were selected, because 18 months was the first follow-up time point that allowed us to examine the comparisons between all three intervention conditions (i.e., child-only, child + caregiver, child + caregiver + community) and the control condition due to a staggered schedule of intervention delivery (see Table 3.1). Besides, mental health outcomes assessed at 18 months and later time points allowed us to test the assumption of temporal precedence in the mediation model, which is that changes in mediators precede changes in the outcomes (MacKinnon, 2008).

Measures

Mental health outcomes. Measures used for mental health outcomes were the same as used in Manuscript 1.

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Mediators. Emotional regulation was assessed using the 6-item emotional regulation

subscale from the *Social Competence Scale* (Corrigan, 2002). Coping was assessed using

a 16-item scale adapted from *Children Coping Strategies Checklist* (Ayers et al., 1996)

and *Schoolagers' Coping strategies Inventory* (Ryan-Wenger, 1990). This scale consisted

of 12 items assessing positive coping and four items assessing negative coping.

Demographic variables. The demographic variables were the same assessed in

Manuscript 1.

Statistical analyses

The latent growth curve model (LGCM) was performed in Mplus 7.0 to test the

hypotheses. The LGCM was selected because of its flexibility in modeling the within-

person changes in mental health outcomes over time as well as between-person

variability in within-person changes (Preacher et al., 2008). First, to model the growth

trajectory for each mental health outcome from 18 to 36 months, both unconditional

linear and nonlinear (quadratic) LGCM models were performed. Time was rescaled at 0,

1, 2, 3, and therefore, the intercept of each LGCM reflected the mean score of the mental

health outcome at 18 months. Models were considered to have an acceptable fit to data if

the comparative fit index (CFI) ≥ 0.90 and the root mean squared error of approximation

(RMSEA) ≤ 0.08 and a good fit if CFI ≥ 0.95 and RMSEA ≤ 0.06 (Hu and Bentler,

1999). Akaike information criterion (AIC) and Bayesian information criterion (BIC) were

used for model selection (linear vs. quadratic). LGCMs with both smaller AIC and BIC

would be selected as the final unconditional models for further analyses.

To examine the main intervention effects, the intervention conditions represented by

three dummy variables were added into the LGCMs as the predictors of the intercept and

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slope, which allowed for the examination of the effects of three intervention conditions (i.e., child-only, child + caregiver, child + caregiver + community) on mental health outcomes. Potential main intervention effects were assessed by the regression coefficients of these three dummy variables on the latent intercept and slope. To test the mediating effects of emotional regulation and coping at 18 months underlying the intervention effects, mediation analyses in the LGCM framework were performed. The analyses were separately carried out for emotional regulation and coping.

The potential mediation effects of emotional regulation and coping were assessed using the product of coefficients outlined by MacKinnon et al. (2002), and the significance for the mediation effects was examined using the option of MODEL CONSTRAINT in Mplus 7.0 (Muthén and Muthén, 2012). The cluster-robust standard errors were obtained for all models to account for school clustering (McNeish et al., 2017).

Table 3.1. The timeline for intervention delivery

Intervention ARM		Months 1-6	Months 7-12	Months 13-18	Months 19-24	Months 25-30	Months 31-36
Child-only	Baseline	Child intervention delivered	Follow-up				
Child + caregiver	Baseline		Caregiver intervention delivered	Follow-up			
Child + caregiver + community	Baseline			Community intervention delivered			
Control	Baseline	Follow-up					

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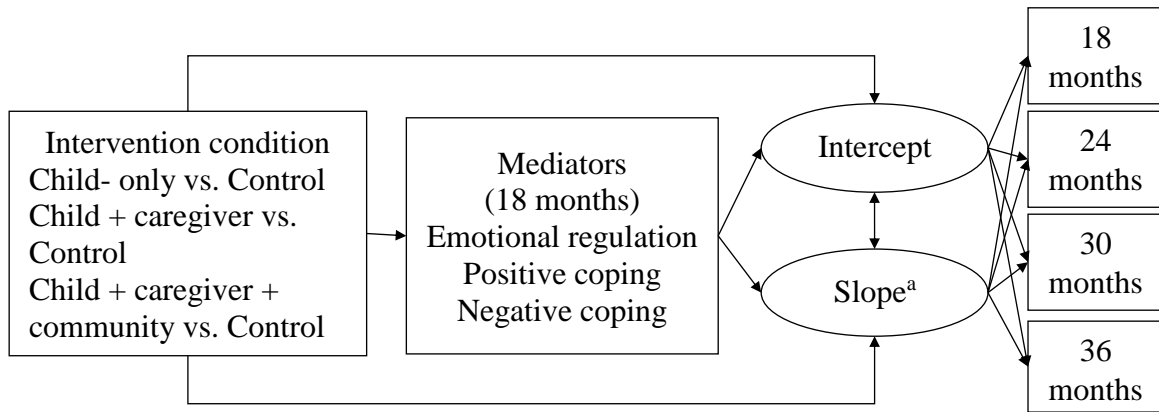
Figure 3.1. The hypothesized mediation model

Note. Model was performed separately for each mental health outcome. [a] A linear growth curve model was displayed for simplicity, but a quadratic slope would be modeled if necessary.

Chapter 4

Results

4.1. Manuscript 1

Effects of a multilevel resilience-based intervention on mental health for children

affected by parental HIV: A cluster randomized controlled trial [1]

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[1] Jiang, Y., Li, X., Harrison, S.E., Zhang, J., Qiao, S., and Zhao J. To be submitted to *Social Science & Medicine*.

Abstract

The present study aimed to examine the efficacy of the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention, a multilevel resilience-based psychosocial intervention, on mental health outcomes, including depressive symptoms, school anxiety, and loneliness among children affected by parental HIV in central China. Seven hundred and ninety children (51.6% boys, 6-17 years of age) affected by parental HIV were randomly assigned by cluster to a control group or one of the three intervention groups designed to test the three conditions of the ChildCARE intervention (child-only, child + caregiver, child + caregiver + community). The linear mixed effects model was performed to test the intervention effects at 6, 12, and 18 months. Results showed that the intervention did not yield significant changes in mental health outcomes for the child-only group at any follow-ups, whereas significant reductions in depressive symptoms and loneliness were observed in the child + caregiver group at 12 months. The observed intervention effects were not sustained at 18 months. Also, children who received the additional community component that was implemented after 12 months did not show improvements in mental health outcomes when compared to the control group at 18 months. Lastly, older children (i.e., ≥ 12 years) were found to benefit more from the intervention, compared to their younger counterparts (i.e., < 12 years). Overall, the findings provide some support for the efficacy of multilevel resilience-based interventions to improve mental health among children affected by parental HIV, but more research is needed to further determine whether multilevel resilience-based interventions can yield sustained effects on mental health for this group.

Keywords: Intervention; resilience; mental health; parental HIV; age

Introduction

The HIV epidemic has had devastating impacts on the global population, with direct impacts for over 36 million people who are currently living with HIV worldwide (UNAIDS, 2018), and indirect impacts for their families and communities (Ji et al., 2007; Boutayeb, 2009). By 2017, approximately 12.2 million children under 18 years old were estimated to have been orphaned by AIDS, with millions more affected by familial HIV (UNICEF, 2017). Children affected by parental HIV, defined as children who have lost one or both of their parents to AIDS-related illness or have one or both of their parents living with HIV (Chi & Li, 2013), have been found to have an increased risk for a variety of poor emotional, educational, and social outcomes (for reviews, see Chi and Li, 2013; Guo et al., 2012; Skovdal, 2012).

Parental HIV and mental health outcomes

In a systematic review on the psychosocial wellbeing of children affected by parental HIV, Chi and Li (2013) indicate that overall, this group has a higher risk of experiencing poor mental health outcomes, including depression, anxiety, and loneliness, compared to children from HIV-unaffected families. The elevated risk for poor mental health among this group is not only driven by parental illness and death, but also by multiple contextual and family factors (Cluver and Orkin, 2009; Tompkins and Wyatt, 2008; Cluver et al., 2013). For example, HIV stigma, defined as prejudice, discrediting, and discrimination towards people living with HIV and individuals they are associated with such as their family members (Herek, 2002), has been linked to increased depression, anxiety, loneliness, and post-traumatic stress among children affected by parental HIV (Lin et al., 2010; Cluver and Orkin, 2009; Boyes and Cluver, 2013). Exposure to poverty and

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community violence has also been found to contribute to increased psychological distress among children affected by parental HIV (Cluver et al., 2013). Children's mental health may also be impacted in indirect ways. Parents living with HIV are at elevated risk for depression and parenting distress, which in turn may contribute to poor quality of parenting (Lachman et al., 2014). Such a constellation of risk factors supports the need for interventions that address multiple socio-ecological levels (e.g., individual, family, community) to reduce risks and improve mental health for children affected by parental HIV.

Resilience

Not all children affected by parental HIV exhibit clinically significant mental health symptoms or show chronically elevated levels of negative developmental outcomes (Chi et al., 2014; Mellins et al., 2008). This phenomenon is illustrative of the construct of resilience, which is defined as "a dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar et al., 2000: p. 453). Resilience frameworks provide a welcome alternative to deficit-focused models for children facing adversity (Masten, 2001), and numerous recent efforts have sought to apply resilience theory to children made vulnerable by HIV (Harrison and Li, 2018).

By integrating perspectives from resilience and ecological systems theory (Masten et al., 1990; Bronfenbrenner, 1989), Li and colleagues (2015) have developed an integrated resilience framework for children affected by parental HIV. This theoretical framework recognizes the unique HIV-related vulnerabilities experienced by this group and posits that enhancing supports from three key ecological systems, including the individual (e.g., coping skills), family (e.g., high-quality parenting), and community (e.g., social support),

may reduce risks for these children. Consistent with this framework, Betancourt et al. (2013) also highlight the importance of adopting integrated ecological perspectives for research on resilience and mental health of children affected by HIV. Such perspectives have important implications for developing resilience-based, multilevel interventions that address the complex nature of risks that this group experience (Betancourt et al., 2013).

Impact of resilience-based interventions on mental health

Resilience-based interventions — defined as interventions that focus on enhancing resilience at one or multiple ecological systems (Dray et al., 2017) — have shown promise in improving mental health of children affected by parental HIV, though some mixed findings have emerged (Skeen et al., 2017). In a systematic review on interventions for psychosocial wellbeing for children affected by HIV, Skeen et al. (2017) identified 17 intervention studies, with six resilience-based interventions targeting mental health outcomes, including depressive symptoms, anxiety, anger, and internalizing behaviors. For example, a post-test study found that enrolling in social support program was significantly associated with less emotional symptoms among children 8-14 years of age in Kenya (Thurman et al., 2012). Similarly, a cluster randomized controlled trial (RCT) found that a peer-support intervention significantly reduced depression, anxiety, and anger among AIDS orphans 10-15 years of age in Uganda (Kumakech et al., 2009). However, three RCTs found that family-based interventions did not decrease internalizing problems or anxiety for children in South Africa (Eloff et al., 2014; Bell et al. 2008) or the United States (Rotheram-Borus et al., 2012). In addition, a community-based intervention targeting self-efficacy found no significant effects on depression among children 8-18 years of age in South Africa (Mueller et al., 2011).

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A few recent evaluations of intervention studies for children affected by parental HIV have been published since Skeen et al. (2017) review. A pilot RCT for children 7-17 years of age with caregivers living with HIV in Rwanda found that a family-based intervention significantly reduced depressive symptoms at 3-month follow-up (Betancourt et al., 2017). Another pilot RCT also showed that a family-based intervention significantly decreased depressive symptoms among children of 6-14 years old living with HIV positive mothers in the United States (Murphy et al., 2017). These studies provide initial support for the efficacy of resilience-based interventions for children affected by parental HIV; however, research in this line is still limited. There is a lack of interventions targeting changes at multiple ecological systems, and data regarding the efficacy of such interventions on improving mental health among other global HIV-affected populations are limited.

Purpose of the current study

The current study aimed to examine the efficacy of a multilevel resilience-based intervention, the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention, on mental health outcomes among children affected by parental HIV in central China. Specifically, this study examined whether the intervention yielded reductions in depressive symptoms, school anxiety, and loneliness at 6, 12, and 18 months. In previous reports of the efficacy of the ChildCARE intervention, improvements have been demonstrated in children's internal resilience resources (Li et al., 2017b) and school outcomes (Harrison et al., 2017; Harrison et al., 2018), as well as caregiver's mental health and parenting (Harrison et al., 2019). Given these initial findings, we hypothesized that the ChildCARE intervention would result in improved mental health outcomes for

participating children. A secondary aim was to explore potential gender and age differences in intervention effects on mental health outcomes. Gender differences have been reported in some previous resilience-based interventions for children's mental health (Dray et al., 2017), and older children affected by parental HIV have shown to be more responsive to resilience-based interventions than their younger counterparts (Li et al., 2017a).

Method

Setting and participants

The implementation and evaluation of the ChildCARE intervention were conducted in a rural county in Henan Province in central China, where an outbreak of HIV emerged in the 1990s, primarily due to the unhygienic commercial blood and plasma collection practices (Li et al., 2009a). The detailed information about participant recruitment had been reported elsewhere (Li et al., 2017b). In brief, researchers worked with local public health officials to compile lists of HIV-affected families in the county and then randomly invited eligible children and their caregivers to participate in the study. Inclusion criteria for recruitment were (1) aged 6-17 years and (2) one or both biological parents were HIV-positive (i.e., alive or deceased). Children with known HIV infection (i.e., verified by caregivers or community officials) were excluded from the study. When multiple children from a family met the recruitment criteria, researchers randomly selected one to participate. The recruitment process repeated until achieving the target sample size (i.e., about 800 child-caregiver dyads).

A total of 790 children (408 boys, 51.6%) participated in the study. The mean age of the sample was 10.51 (*SD* = 1.99), with the majority of children (94.4%) between 8 and

15 years of age. Of the participating children, approximately 9.3% lost one biological parent to AIDS (i.e., "single death"), 3.1% lost both parents to AIDS (i.e., "double death"), 72.6% had one parent currently living with HIV (i.e., "singe infection"), and 15.1% had both parents currently living with HIV (i.e., "double infection"). The mean number of family members ever infected with HIV in the household was $1.07(SD = 1.01)$, and the mean number of HIV-related death in the household was $0.45(SD = 0.78)$. Children reported a mean number of 1.77 ($SD = 1.20$) siblings. In addition, 59.3% of fathers and 58.2% of mothers of participating children had less than high school education. The majority of parents were farmers (46.2% of mothers, 32.9% of fathers) and migrant workers (28.3% of mothers, 42.6% of fathers).

The ChildCARE intervention

The ChildCARE intervention, building upon the resilience framework of Li et al. (2015), is a culturally tailored psychosocial intervention developed for children affected by parental HIV in China (Li et al., 2017b). The intervention consists of programming at three-level: child, caregiver, and community. The child-level component includes ten 2-hour peer-group sessions for children that aim to develop the multiple skills, such as coping, emotional regulation, and positive thinking (for detailed information on intervention sessions see Li et al., 2017b). The caregiver-level component includes five 2-hour interactive parenting training sessions for caregivers of children that aim to develop positive parenting skills and increase their capacity of self-care and support-seeking. The community-level component includes monthly home visits by intervention facilitators and a series of community-based activities that aim to promote cohesion and community engagement, as well as to enhance community social support.

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Intervention assignment and delivery

The ChildCARE intervention was initially evaluated using a 4-arm community-based cluster RCT from 2012 to 2016. Participating children were clustered by the schools which they were currently attending, and the school clusters ($n = 45$) then served as the unit of randomization for assignment to the control group or one of the three intervention groups: : a child-only group (i.e., received child component), a child + caregiver group (i.e., received both child and caregiver components), and a child + caregiver + community group (i.e., received all three intervention components).. Due to resource constraints, the three intervention components were implemented on a staggered six-month schedule. Specifically, the child intervention component was delivered between baseline and 6 months at the local school, the caregiver intervention component was delivered between 6 and 12 months at the local school, and the community intervention component was delivered between 12 and 36 months in homes and local community settings. This implementation schedule allows for the examination of the effect of the child-only component at 6 months, the effect of the child + caregiver components at 12 months, and the effect of the child + caregiver + community components at 18 months. Standardized training and the intervention manual were provided to intervention facilitators (e.g., master students in psychology and education) to increase intervention fidelity.

Data collection

After randomization, children were asked to complete a survey consisting of demographic and psychosocial scales in Chinese. The same survey was also administrated at 6, 12, and 18 months. A forward and backward translation process was

performed for scales that were initially developed in English by English-Chinese bilingual research team members (Fang et al., 2009). At each assessment, the survey was self-administered using a paper-and-pencil instrument individually or in small groups in the presence of two interviewers. A small portion of participants (i.e., about 2%) needed assistance from the reviewers to read survey items, either due to age or reading difficulties. For these participants, interviewers read the items aloud and recorded children's oral responses to the survey in a private room. Each child received an age-appropriate gift (e.g., a toy or school-supply) at the end of each assessment. Prior to participation, appropriate informed consent was obtained from all children and their caregivers. The study protocol was approved by Institutional Review Boards at Henan University in China and Wayne State University and the University of South Carolina in the United States.

Measures

Depressive symptoms. Depressive symptoms were measured using the 10-item *Center for Epidemiological Studies Depression Scale for Children* (CES-DC, Fendrich et al., 1990; Andresen et al., 1994). The reliability and validity of the CES-DC have been established in a large sample of children from urban and rural areas in China (Xiong, 2015). Sample items were "I was bothered by things that usually don't bother me" and "I felt like something good was going to happen" (reversed coded). Children were asked to report how frequently they had experienced each of the 10 moods or symptoms during the past week on a 4-point scale (from 0 = not at all to 3 = a lot). A sum score for depressive symptoms was calculated by summing children's responses to the 10 items, with a higher score reflecting more severe depressive symptoms. For children with

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missing responses for one item only (i.e., fewer than 3% of the sample), the missing item was imputed by replacing with the mean score of the remaining nine completed items, as recommended by Andresen et al. (1994). Children with missing responses for two items or above (i.e., fewer than 2%) were treated as missing in the data analysis. The Cronbach αs for the CES-DC were 0.62 at baseline, 0.69 at 6 months, 0.72 at 12 months, and 0.73 at 18 months.

School anxiety. School anxiety was measured using the 6-item anxiety/withdrawal subscale adapted from the *Child Rating Scale* (CRS, Hightower et al., 1987). The CRS has been applied in previous studies among children affected by parental HIV in China (e.g., Li et al., 2009b). Sample items were "I worry about things at school" and "I am nervous at school." Children were asked to assess how well each of the six items describes them on a 4-point scale ranging from 1 = "does not describe me at all" to 4 = "totally describes me." A mean score for school anxiety was calculated by averaging children's responses across the six items, with a higher score reflecting more severe school anxiety. The Cronbach αs were 0.51 at baseline, 0.64 at 6 months, 0.68 at 12 months, and 0.74 at 18 months.

Loneliness. Loneliness was measured using the 16-item *Loneliness Scale for Children* (Asher et al., 1984). This scale has also been applied in previous studies among children affected by parental HIV (e.g., Fang et al., 2009). Sample items were "I feel alone" and "I have nobody to talk to." Children were asked to report how well each of the 16 items describes them on a 4-point scale ranging from 1 = "does not describe me at all" to 4 = "totally describes me." A mean score for loneliness was calculated by averaging children's responses across the 16 items, with a higher score reflecting higher loneliness.

The Cronbach αs were 0.77 at baseline, 0.79 at 6 months, 0.83 at 12 months, and 0.84 at 18 months.

Demographic variables. Children were asked to provide information on their gender, age, household composition (e.g., number of siblings), parents' education and occupation, and HIV infection and HIV-related death in the household.

Data analyses

All data analyses were performed using SPSS Version 25.0 for Windows (IBM Corp. Released 2017. Armonk, NY). First, descriptive analyses were conducted for baseline demographic variables and outcome variables. Analyses of variance (ANOVA) for continuous variables and the Chi-square test for categorical variables were performed to test mean (or frequency) differences in baseline characteristics by intervention assignment. Multiple testing via Bonferroni method was employed to determine where the differences occurred between two intervention assignments. ANOVA was also performed to test whether there were any differences in baseline mental health outcomes between the intervention and control groups among children who had missing data at each follow-up.

Second, the linear mixed effects model was used to test for intervention effects, which allows adding a random intercept to account for the correlations among repeated measures and for the nesting of children within school clusters. In the models, the intervention conditions (e.g., control, child-only, child + caregiver, child + caregiver + community), time (e.g., 0[baseline], 6 months, 12 months, 18 months), and the 2-way interaction terms between the intervention conditions and time were included as predictors of each mental health outcome. Gender and age were included as covariates in

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the model. The number of HIV infection in the household was also included as a covariate due to the observed inequivalence by intervention assignment (Li et al., 2017b). Third, the linear mixed effects model outlined above was also used to test gender and age differences in the intervention effects. In the model, all possible two-way and three-way interaction terms among gender (or age), the intervention conditions, and time were included as predictors. Fourth, to interpret potential significant gender and age differences in intervention effects, the analyses for linear mixed effects models were stratified by gender (i.e., boys, girls) and baseline age (i.e., below 12 years old [67.7% of the sample], 12 years and above). Age 12 was chosen as the cutoff because it marks a developmental transition from primary school to secondary school among Chinese children (UNICEF, 2014). All models were performed using restricted maximum likelihood estimation (Gilmour et al., 1995).

Results

Descriptive and attrition analyses

Table 4.1 displays the results for baseline demographic characteristics by intervention assignment. Results showed that there were significant differences in age, parental vital status, and the number of HIV infection in the household between the intervention groups and the control group ($ps < .05$).

Table 4.2 displays the mean and standard deviations of mental health outcomes at baseline and follow-ups by intervention assignment. Overall, children had a mean score of 10.36 ($SD = 4.35$) on the 10-item CES-DC scale at baseline. When using the cutoff score of 15 for clinical depression recommended by Xiong (2015) for Chinese children, about 19.1% of children were at risk for clinical depression. Children had an overall

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mean score of 1.95 ($SD = 0.59$) for school anxiety and 2.13 ($SD = 0.47$) for loneliness at baseline. There were no significant differences in baseline mental health outcomes by intervention assignment ($ps > .05$). Data for three mental health outcomes were missing for 6.8% of children at 6 months, 14.2% at 12 months, and 16.6% at 18 months. Attrition analyses showed that there were no significant differences in baseline mental health outcomes by intervention assignment among children with missing data at each follow-up ($ps > .05$, see Table 4.3).

Overall intervention effects

Table 4.4 displays the results of the intervention effects on mental health outcomes at 6, 12, and 18 months. Results showed that there were no significant changes in mental health outcomes at 6 months following the delivery of the child intervention component (unstandardized $b = 0.08$, $p = .32$ for depressive symptoms; $b = -0.01$, $p = .24$ for school anxiety; $b = 0.00$, $p = .82$ for loneliness). However, significant reductions in depressive symptoms ($b = -0.15$, $p = .009$) and loneliness ($b = -0.02$, $p = .002$), but not school anxiety ($b = -0.01$, $p = .27$), were observed for the child + caregiver group at 12 months (i.e., immediately following the delivery of the caregiver intervention component). The observed intervention effects in the child + caregiver group at 12 months were not maintained at 18 months. In addition, there were no additional intervention effects on mental health outcomes at 18 months after the community intervention was first delivered (i.e., the child + caregiver + community group, $b = 0.07$, $p = .35$ for depressive symptoms, $b = 0.01$, $p = .54$ for school anxiety, $b = 0.01$, $p = .82$ for loneliness). A significant but negative intervention effect on school anxiety was observed for the child-only group at 18 months ($b = 0.01$, $p = .022$).

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Gender and age difference in intervention effects

There was a significant three-way interaction term (gender by child-only intervention by time) on school anxiety at 6 months ($b = 0.06$, $p = .002$), but significant three-way interaction terms were not found for either depressive symptoms or loneliness ($ps > .05$, see Table 4.5). Stratified linear mixed effects models by gender showed that a positive intervention effect on school anxiety was found for girls ($b = -0.05$, $p = .003$, see Table 4.6), but not for boys ($b = 0.02$, $p = .22$) at 6 months. Figure 4.1a presents the mean scores of school anxiety across time and shows a graphical interpretation of this gender difference in intervention effects.

Significant three-way interaction terms (age by child + caregiver group by time) were observed for school anxiety at both 12 and 18 months ($b = -0.10$, $p = .018$; $b = -0.01$, $p = .011$; respectively, see Table 4.7). Stratified linear mixed effects models by age showed that there was a significant reduction in school anxiety for children 12 years of age and older ($b = -0.04$, $p = .017$, see Figure 4.1b), but not for children below 12 years of age ($b = 0.00$, $p = .64$), in the child + caregiver group at 12 months. The observed positive intervention effect at 12 months for children 12 years of age and older did not maintain at 18 months ($b = -0.01$, $p = .13$), whereas a negative intervention effect was observed for children below 12 years of age ($b = 0.01$, $p = .028$). Lastly, there were significant three-way interaction terms among age, the intervention conditions (i.e., child-only group, child + caregiver group), and time in predicting loneliness at 18 months ($b = -.00$, $p = .017$ for child-only; $b = -0.01$, $p = .015$ for child + caregiver). Stratified analyses showed that significant positive intervention effects on loneliness were found at 18 months for children 12 years of age and older in both the child-only ($b = -0.02$, $p < .001$, see Figure

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4.1c) and child + caregiver groups ($b = -0.02$, $p = .004$, see Figure 4.1d), whereas there were no intervention effects for those below 12 years of age in the child-only group ($b = 0.00$, $p = .78$) and even negative intervention effects (i.e., increased loneliness) in the child + caregiver group ($b = 0.01$, $p = .013$).

Discussion

The complex challenges that children affected by parental HIV experience call for interventions to foster resilience using socio-ecological and theory-driven frameworks. This study is one of the first studies to examine the efficacy of a multilevel resilience-based intervention on mental health outcomes among children affected by parental HIV in rural China. Overall, our results showed that the ChildCARE intervention contributed to reductions in depressive symptoms and loneliness for some participants at 12 months, although most of the intervention effects were not sustained at 18 months. The results also indicated gender differences in the intervention effects at 6 months and age differences in the intervention effects at both 12 and 18 months, with girls and older children more responsive to the intervention than boys and younger children.

This study showed that children who received only the child component of the ChildCARE intervention did not show significant improvements in mental health outcomes, whereas those who received both the child and caregiver intervention components showed more reductions in depressive symptoms and loneliness than children in the control group at 12 months. The results suggest that child intervention component, alone, may not be sufficient to contribute to better mental health, as measured by self-report of symptoms of depression, school anxiety, and loneliness. Instead, addressing both individual- and family-levels factors may be necessary to

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produce meaningful changes in these outcomes. These findings echo previous studies emphasizing the need for intervention to enhance resilience across multiple ecological systems for HIV-affected children (Betancourt et al., 2013). Interestingly, our study did not observe intervention effects after the community intervention component was delivered at 18 months. This nonsignificant result may be due to the short duration between the delivery of the community intervention component and the evaluation point. However, a more likely reason for the lack of findings is that the community intervention component was primarily designed to promote community cohesion and support. Although increased community support may indirectly impact children's mental health, the evaluation timeframe and the assessment measures used in the current study may not have been sufficient to detect potential individual-level mental health impacts. However, results from some previous studies suggested the benefits of the community intervention component. Specifically, the ChildCARE intervention was found to be most beneficial for children who received all components with regard to school outcomes (e.g., academic performance and school interest), compared to children who received either the child-only component or both child and caregiver components (Harrison et al., 2018).

Our results further indicated that most of the intervention effects observed at 12 months were not sustained at 18 months. The lack of sustained changes in mental health may be due to multiple reasons. First, a time-limited, manual-based intervention may not be enough to result in sustained improvements in mental health among children affected by parental HIV, particularly given the tremendous challenges they may face (Betancourt et al., 2013; Chi and Li, 2013). More intensive interventions or repeated sessions (e.g., booster sessions) might be necessary to make more robust improvements in mental

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health. Second, the delivery of the ChildCARE intervention was not embedded within the school system. Although schools served as the delivery site for the intervention, local school personnel were not involved in intervention delivery, and the intervention content was not linked to or coordinated with other school-based services (e.g., social-emotional programs, school counseling services). In contrast, interventions embedded with school systems that provide a continuum of integrative care have been previously found to have sustained impacts on mental health improvement (Fazel et al., 2014).

Unexpectedly, the intervention yielded a negative effect on school anxiety in the child-only group at 18 months. Interestingly, a negative effect on caregiver parenting competence was also observed in a previous study on the efficacy of the ChildCARE intervention (Harrison et al., 2019). One possible explanation for this unexpected result is that the intervention may raise awareness about the challenges this group experienced, which in turn contributes to increases in school anxiety. Another possible explanation is that some unmeasured events may have occurred during this follow-up period that yielded increased school anxiety for the child-only group assigned by the school-based clusters, given that no negative effects were found for school anxiety at 6 or 12months.

Although no overall intervention effects were observed at 6 months, our study indicated that girls gained more benefits from the child intervention component than boys. One possible explanation for this result is the potential gender difference in school anxiety. Girls have been suggested to more likely to experience anxiety at school than boys (Freudenthaler et al., 2008; Frawley et al., 2014), which in turn may make them more motivated to participate in the intervention and have more room to show symptom reductions (Stice and Shaw, 2004). However, such gender differences in the intervention

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effects were only limited to school anxiety at 6 months. Future studies are needed to confirm whether similar child-focused interventions may yield different outcomes by gender, particularly in the context of parental HIV.

The results also indicated that older children benefited more from the intervention than their younger counterparts. This finding is consistent with a previous resilience-based intervention for HIV-affected family in China that showed better improvements in behavioral outcomes for older children than younger ones (Li et al., 2017a). One possible explanation for this result might be the developmental differences in understanding the curriculum and contents of the intervention. Compared to younger children, older children might have a better understanding of the content of the ChildCARE intervention due to more mature cognitive skills (Burnett and Blakemore, 2009). Older children may also benefit more from the potential reductions in HIV-stigma that the intervention may yield, as young children may not be as aware of subtle acts of isolation and discrimination as their older counterparts. This age-related finding highlights the need for similar interventions to be tailored to the developmental and cognitive stages of the targeted population in order to maximize their efficacy on mental health outcomes.

Limitations

The findings in this study, however, should be cautiously interpreted due to some limitations. First, schools, rather than individual children, were used as the units of randomization in this study. Although cluster randomization could help to reduce contamination between the intervention and control groups, it resulted in some significant differences in baseline demographic variables (e.g., age) across intervention assignments. Second, this study exclusively relied on children's self-reports for assessing mental health

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outcomes, which may be subject to self-report bias. Also, some measures (e.g., school anxiety) were not previously validated among children in China and displayed relatively low internal consistency at baseline. Culturally validated measures for mental health outcomes should be considered in future studies, as well as validation through clinical assessment. Third, our results may not generalize into other cultural contexts. For example, the cause of the HIV epidemic in central China is largely distinct from HIV epidemics in most other areas of the world — where the HIV epidemic is primarily driven by stigmatized behaviors (e.g., sexual activity, injection drug use). The impact of HIV on children and caregivers in this study might be different from other families that are stigmatized due to other modes of HIV transmission (Li et al., 2006).

Despite the limitations, this study provides preliminary evidence to support the efficacy of a multilevel resilience-based intervention in improving some mental health outcomes among children affected by parental HIV. Our study also indicates that challenges remain in developing effective and sustained approaches to remedy the complex challenges encountered by children and families affected by HIV in China. Future studies are needed to examine whether more intensive, school-embedded, and age-tailored resilience-based interventions could achieve more sustained and meaningful improvements in mental health for this population. Future studies are also needed to identify the active components in the ChildCARE intervention that are most responsible for mental health, which help to provide further implications for future intervention development.

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Table 4.1. Demographic variables by intervention assignment

Variables	Overall	Control	Intervention groups		
			Child-only	Child + Caregiver	Child + caregiver + community
N (%)	790(100%)	195(24.7%)	200(25.3%)	198(25.1%)	197(24.9%)
Boys	408(51.6%)	113(57.9%)	96(48.0%)	104(52.5%)	95(48.2%)
Age (*SD*)	10.51(1.99)	10.62(2.07)	11.24(2.30)[a]	10.39(1.64)	9.77(1.59)[a]
# of siblings	1.77(1.20)	1.80(1.20)	1.73(1.10)	1.81(1.20)	1.74(1.29)
Parental vital status					
Single death	72(9.3%)	22(12.1%)	20(10.0%)	15(7.6%)	15(7.7%)
Double death	24(3.1%)	7(3.8%)	5(2.5%)	9(4.5%)	3(1.5%)
Single infection	563(72.6%)	134(73.6%)	129(64.5%)	135(68.2%)	165(84.2%)
Double infection	117(15.1%)	19(10.4%)	46(23.0%)[a]	39(19.7%)	13(6.6%)
Familial HIV infection & death					
# of infection in household	1.07(1.01)	1.14(1.16)	1.18(0.86)	1.15(0.98)	0.80(0.97)[a]
# of death in household	0.45(0.78)	0.52(0.88)	0.41(0.78)	0.48(0.70)	0.39(0.72)
Father's education					
No formal schooling	19(2.4%)	2(1.0%)	6(3.0%)	5(2.5%)	6(3.1%)
Elementary school	255(32.5%)	66(34.2%)	67(33.5%)	66(33.3%)	56(29.0%)
Middle school	191(24.4%)	50(25.9%)	73(36.5%)	37(18.7%)	31(16.1%)
High school	61(7.8%)	16(8.3%)	10(5.0%)	17(8.6%)	18(9.3%)
College-level	51(6.5%)	12(6.2%)	8(4.0%)	15(7.6%)	16(8.3%)
Do not know	207(26.4%)	47(24.4%)	36(18.0%)	58(29.3%)	66(34.2%)
Mother's education					
No formal schooling	46(6.0%)	11(5.8%)	12(6.1%)	14(7.1%)	9(4.8%)
Elementary school	249(32.3%)	64(33.7%)	71(35.9%)	63(32.1%)	51(27.1%)
Middle school	154(19.9%)	38(20.0%)	55(27.8%)	31(15.8%)	30(16.0%)
High school	59(7.6%)	16(8.4%)	12(6.1%)	15(7.7%)	16(8.5%)
College	46(6.0%)	8(4.2%)	9(4.5%)	12(6.1%)	17(9.0%)

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Do not know	218(28.2%)	53(27.9%)	39(19.7%)	61(31.1%)	65(34.6%)
Father's occupation					
Farmer	252(32.9%)	65(34.8%)	70(35.2%)	68(36.0%)	49(25.8%)
Migrant worker	326(42.6%)	73(39.0%)	84(42.2%)	76(40.2%)	93(48.9%)
Teachers/ village administrators/ business/others	186(24.5%)	49(26.2%)	45(22.6%)	45(23.8%)	48(25.3%)
Mother's occupation					
Farmer	349(46.2%)	85(46.4%)	100(50.0%)	88(47.6%)	76(40.6%)
Migrant worker	214(28.3%)	49(26.8%)	51(25.5%)	52(28.1%)	62(33.2%)
Teachers/ village administrators / business/others	192(25.5%)	49(26.8%)	49(24.5%)	45(24.3%)	49(26.2%)

Note. The numbers for some demographic variables did not add to the total sample size due to missing data (an average of 2.5% missing). [a] Represents any differences from Bonferroni post hoc tests between the control and intervention groups at $p < .05$.

Table 4.2. Means and standard deviations for mental health outcomes by intervention assignment

Variables	Overall				Intervention groups			p
	α	Range	Mean (*SD*)	Control	Child-only	Child + Caregiver	Child + caregiver + community	
Depressive symptoms								
Baseline	0.62	0-25	10.36(4.35)	10.70(4.42)	10.16(4.29)	10.51(4.02)	10.09(4.67)	.47
6-month	0.69	0-24	10.88(4.77)	10.81(4.81)	11.74(4.38)	10.96(4.95)	10.02(4.82)	
12-month	0.72	0-27	9.81(4.71)	10.19(4.63)	10.50(4.79)	9.72(4.49)	8.86(4.81)	
18-month	0.73	0-24	9.82(4.80)	9.67(4.92)	10.41(4.61)	10.24(4.49)	8.94(5.06)	
School anxiety								
Baseline	0.51	1-4	1.95(0.56)	1.99(0.53)	1.89(0.56)	1.97(0.54)	1.94(0.59)	.32
6 months	0.64	1-4	1.95(0.59)	2.05(0.62)	2.01(0.59)	1.89(0.58)	1.86(0.54)	
12 months	0.68	1-4	1.81(0.58)	1.87(0.61)	1.84(0.58)	1.82(0.54)	1.72(0.57)	
18 months	0.74	1-4	1.80(0.62)	1.81(0.65)	1.91(0.65)	1.83(0.61)	1.66(0.55)	
Loneliness								
Baseline	0.77	1-3.38	2.13(0.47)	2.11(0.49)	2.10(0.47)	2.15(0.42)	2.16(0.48)	.54
6 months	0.79	1-3.75	2.16(0.48)	2.13(0.46)	2.26(0.44)	2.17(0.49)	2.10(0.50)	
12 months	0.83	1-3.19	2.02(0.51)	2.10(0.51)	1.99(0.51)	2.02(0.51)	1.99(0.52)	
18 months	0.84	1-3.63	2.09(0.52)	2.08(0.54)	2.08(0.51)	2.17(0.44)	2.03(0.56)	

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Table 4.3. Attrition rates and differences in baseline mental health outcomes among children with missing data at follow-ups by intervention assignment

	Overall	Control	Child-only	Child + caregiver	Child + caregiver + community	p
			Intervention groups			
Attrition rates[a]						
6 months	54(6.8)	18(9.2)	15(7.5)	10(5.1)	11(5.6)	-
12 months	112(14.2)	38(19.5)	28(14.0)	24(12.1)	22(11.2)	-
18 months	131(16.6)	46(23.6)	35(17.5)	24(12.1)	26(13.2)	-
Missing at 6 months						
Depressive symptoms	-	11.41(4.94)	10.64(5.27)	11.70(4.72)	10.57(3.60)	.93
School anxiety	-	2.19(0.58)	2.03(0.69)	2.15(0.48)	2.10(0.51)	.88
Loneliness	-	2.06(0.55)	2.11(0.57)	2.21(0.35)	2.40(0.32)	.49
Missing at 12 months						
Depressive symptoms	-	10.48(4.19)	9.15(4.30)	10.04(4.20)	10.90(4.56)	.51
School anxiety	-	1.95(0.54)	1.98(0.60)	1.85(0.46)	2.12(0.51)	.42
Loneliness	-	2.00(0.48)	2.09(0.49)	2.13(0.41)	2.34(0.44)	.08
Missing at 18 months						
Depressive symptoms	-	10.64(4.00)	10.29(4.99)	10.36(4.59)	10.68(4.83)	.98
School anxiety	-	2.00(0.52)	1.97(0.58)	1.97(0.48)	2.12(0.45)	.72
Loneliness	-	1.94(0.47)	2.13(0.55)	2.11(0.35)	2.27(0.50)	.06

Note. [a] Defined as children who had missing data on three mental health outcomes at each follow-up.

Table 4.4. Linear mixed effects models for mental health outcomes at 6, 12, and 18 months

	Depressive symptoms		School anxiety		Loneliness	
	b	SE	b	SE	b	SE
At 6 months						
Fixed effects						
Gender (Ref. Girl)	0.482	0.265	0.008	0.032	0.077	0.027[**]
Age	0.060	0.078	0.006	0.010	0.000	0.008
# of HIV infection in household	0.026	0.136	0.003	0.016	-0.010	0.014
Child-only	-0.271	0.447	-0.045	0.064	0.039	0.052
Time	0.033	0.070	0.011	0.009	0.004	0.007
Child-only * time	0.081	0.081	-0.012	0.010	0.002	0.008
Random effects						
Intercept	0.578	0.289	0.019	0.007	0.012	0.004
At 12 months						
Fixed effects						
Gender (Ref. Girl)	0.680	0.243[**]	0.012	0.029	0.083	0.026[**]
Age	0.136	0.074	0.010	0.009	0.000	0.008
# of HIV infection in household	0.030	0.124	0.008	0.015	-0.004	0.013
Child-only	-0.228	0.441	-0.061	0.062	0.058	0.050
Child + caregiver	1.193	0.617	-0.011	0.080	0.149	0.065[*]
Time	-0.045	0.037	-0.012	0.005[**]	-0.001	0.004
Child-only * time	0.077	0.049	0.005	0.006	-0.009	0.005
Child + caregiver * time	-0.154	0.059[**]	-0.008	0.007	-0.019	0.006[**]
Random effects						
Intercept	0.631	0.273	0.018	0.006	0.011	0.004
At 18 months						
Fixed effects						
Gender (Ref. Girl)	0.668	0.229[**]	0.029	0.028	0.087	0.025[**]
Age	0.140	0.071[*]	0.011	0.009	0.002	0.008
# of HIV infection in household	0.142	0.117	0.013	0.014	-0.004	0.013

Child-only	-0.175	0.438	-0.054	0.062	0.058	0.050
Child + caregiver	0.274	0.546	-0.080	0.073	0.006	0.058
Child + caregiver + community	-1.439	1.113	-0.196	0.137	-0.160	0.113
Time	-0.057	0.025*	-0.012	0.003***	-0.002	0.002
Child-only * time	0.057	0.033	0.010	0.004*	-0.004	0.003
Child + caregiver * time	-0.003	0.040	0.005	0.005	0.002	0.004
Child + caregiver + community * time	0.067	0.072	0.005	0.009	0.008	0.007
Random effects						
Intercept	0.676	0.280	0.019	0.006	0.012	0.004

Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 4.5. Conditional intervention effects on mental health outcomes by gender at 6, 12, and 18 months

	Depressive symptoms		School anxiety		Loneliness	
	b	*SE*	*b*	*SE*	*b*	*SE*
At 6 months						
Fixed effects						
Age	0.063	0.078	0.005	0.010	0.000	0.008
# of HIV infection in household	0.018	0.137	0.004	0.016	-0.011	0.014
Gender (Ref. Girl)	0.463	0.649	0.112	0.080	0.041	0.068
Child-only	-0.321	0.609	0.066	0.082	0.036	0.068
Time	0.101	0.107	0.026	0.013[*]	0.004	0.011
Gender*Child-only	0.098	0.744	-0.207	0.092[*]	0.002	0.078
Gender* time	-0.122	0.142	-0.028	0.018	-0.001	0.014
Child-only * time	0.008	0.121	-0.045	0.015[**]	-0.007	0.012
Gender*Child-only*time	0.133	0.163	0.063	0.020[**]	0.017	0.016
Random effects						
Intercept	0.570	0.288	0.019	0.006	0.012	0.004
At 12 months						
Fixed effects						
Age	0.140	0.074	0.010	0.009	0.001	0.008
# of HIV infection in household	0.019	0.125	0.009	0.015	-0.005	0.013
Gender (Ref. Girl)	0.233	0.617	0.051	0.075	0.023	0.062
Child-only	-0.377	0.592	0.004	0.078	0.046	0.064
Child + caregiver	1.291	0.845	-0.040	0.106	0.054	0.086
Time	-0.041	0.056	-0.012	0.007	-0.005	0.006
Gender *Child-only	0.234	0.715	-0.124	0.087	0.015	0.073
Gender*Child + caregiver	-0.298	1.118	0.063	0.132	0.178	0.109
Gender*time	-0.008	0.074	0.000	0.009	0.007	0.007
Child-only*time	0.039	0.072	0.001	0.009	-0.009	0.007
Child + caregiver*time	-0.221	0.085[*]	-0.006	0.010	-0.012	0.009
Gender *Child-only*time	0.074	0.097	0.009	0.012	0.000	0.010

Gender* Child + caregiver*time	0.140	0.119	-0.003	0.014	-0.012	0.012
Random effects						
Intercept	0.620	0.270	0.018	0.006	0.011	0.004
At 18 months						
Fixed effects						
Age	0.147	0.071[*]	0.011	0.009	0.003	0.008
# of HIV infection in household	0.130	0.117	0.014	0.014	-0.005	0.013
Gender (Ref. Girl)	0.337	0.597	0.030	0.072	0.048	0.060
Child-only	-0.285	0.582	-0.006	0.077	0.062	0.063
Child + caregiver	0.050	0.738	-0.093	0.095	-0.066	0.076
Child + caregiver + community	-2.225	1.528	-0.063	0.185	-0.137	0.154
Time	-0.034	0.037	-0.016	0.005[**]	-0.001	0.004
Gender*Child-only	0.168	0.695	-0.098	0.085	-0.015	0.070
Gender*Child + caregiver	0.400	0.945	0.027	0.114	0.140	0.092
Gender*Child + caregiver + community	1.628	2.163	-0.278	0.259	-0.054	0.216
Gender*time	-0.042	0.050	0.006	0.006	-0.002	0.005
Child-only*time	0.019	0.048	0.011	0.006	-0.009	0.005
Child + caregiver * time	-0.028	0.057	0.005	0.007	0.003	0.006
Child + caregiver + community * time	0.043	0.100	-0.002	0.012	0.001	0.010
Gender*Child-only *time	0.073	0.065	-0.002	0.008	0.011	0.006
Gender*Child + caregiver * time	0.047	0.079	0.000	0.010	-0.002	0.008
Gender*Child + caregiver + community * time	0.041	0.144	0.017	0.018	0.014	0.014
Random effects						
Intercept	0.660	0.275	0.019	0.006	0.012	0.004

Note. [*] $p < .05$, [**] $p < .01$.

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Table 4.6. Conditional intervention effects on mental health outcomes by age at 6, 12, and 18 months

	Depressive symptoms		School anxiety		Loneliness	
	b	SE	b	SE	b	SE
At 6 months						
Fixed effects						
Gender (Ref. Girl)	0.485	0.266	0.007	0.032	0.080	0.027[**]
# of HIV infection in household	0.014	0.137	0.002	0.016	-0.013	0.014
Child-only	-0.315	0.451	-0.052	0.065	0.041	0.053
Age	-0.320	0.178	-0.006	0.023	-0.076	0.019[***]
Time	0.024	0.069	0.010	0.009	0.002	0.007
Age*Child-only	0.212	0.206	-0.026	0.026	0.060	0.022[**]
Child * time	0.095	0.079	-0.011	0.010	0.004	0.008
Age* time	0.123	0.034[***]	0.007	0.004	0.015	0.003[***]
Age*Child-only*time	-0.047	0.040	0.006	0.005	-0.005	0.004
Random effects						
Intercept	0.614	0.301	0.020	0.007	0.012	0.005
At 12 months						
Fixed effects						
Gender (Ref. Girl)	0.667	0.243[**]	0.009	0.030	0.084	0.026[**]
# of HIV infection in household	0.018	0.125	0.008	0.015	-0.006	0.013
Child-only	-0.247	0.448	-0.069	0.062	0.065	0.051
Child + caregiver	1.191	0.637	0.010	0.081	0.163	0.067[*]
Age	-0.243	0.171	-0.012	0.021	-0.062	0.018[**]
Time	-0.042	0.036	-0.011	0.004[*]	-0.001	0.004
Age *Child-only	0.170	0.199	-0.012	0.025	0.060	0.021[**]
Age*Child + caregiver	0.287	0.338	0.063	0.040	0.077	0.034[*]
Child-only*time	0.051	0.049	0.001	0.006	-0.011	0.005[*]
Child + caregiver*time	-0.141	0.060[*]	-0.010	0.007	-0.019	0.006[**]
Age*time	0.060	0.018[**]	0.007	0.002[**]	0.007	0.002[***]
Age*Child-only*time	-0.009	0.023	0.000	0.003	-0.003	0.002

	Est.	SE	Est.	SE	Est.	SE
Age* Child + caregiver*time	-0.027	0.034	-0.009	0.004*	-0.006	0.003
Random effects						
Intercept	0.695	0.292	0.018	0.006	0.012	0.004
At 18 months						
Fixed effects						
Gender (Ref. Girl)	0.663	0.230**	0.026	0.028	0.088	0.025**
# of HIV infection in household	0.130	0.117	0.013	0.014	-0.006	0.013
Child-only	-0.161	0.451	-0.061	0.062	0.064	0.051
Child + caregiver	0.421	0.564	-0.063	0.074	0.020	0.060
Child + caregiver + community	-0.517	1.238	-0.162	0.151	-0.110	0.126
Age	-0.218	0.167	-0.015	0.021	-0.063	0.017***
Time	-0.053	0.025*	-0.011	0.003***	-0.001	0.002
Age*Child-only	0.179	0.196	-0.005	0.024	0.062	0.021**
Age*Child + caregiver	0.490	0.287	0.057	0.035	0.076	0.029**
Age*Child + caregiver + community	1.427	0.694*	0.064	0.084	0.121	0.070
Child-only*time	0.042	0.033	0.007	0.004	-0.005	0.003
Child + caregiver * time	-0.011	0.040	0.003	0.005	0.002	0.004
Child + caregiver + community * time	0.021	0.080	0.003	0.010	0.005	0.008
Age*time	0.036	0.012**	0.006	0.002***	0.006	0.001***
Age*Child-only *time	-0.005	0.016	-0.001	0.002	-0.004	0.002*
Age*Child + caregiver * time	-0.036	0.023	-0.007	0.003*	-0.006	0.002*
Age*Child + caregiver + community * time	-0.087	0.045	-0.007	0.006	-0.009	0.004
Random effects						
Intercept	0.781	0.311	0.019	0.006	0.013	0.005

Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

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Table 4.7. Summary of results from linear mixed effects models stratified by gender and age on mental health outcomes[a]

	Gender differences			
	School anxiety		Loneliness	
	Boys	Girls	Boys	Girls
At 6 months				
Child-only*time	0.017(0.014)	-0.045(0.015)**	-	-
	Age differences			
	School anxiety		Loneliness	
	Below 12	12 or older	Below 12	12 or older
At 12 months				
Child + caregiver *time	0.004(0.008)	-0.037(0.015)*	-	-
At 18 months				
Child-only*time	-	-	0.001(0.004)	-0.021(0.005)***
Child + caregiver *time	0.013(0.006)*	-0.015(0.010)	0.012(0.005)*	-0.020(0.007)**

Note. Unstandardized coefficient (standard errors) were represented. [a] stratified analyses were only performed for models with significant three-way interaction terms among gender (or age), intervention conditions, and time.
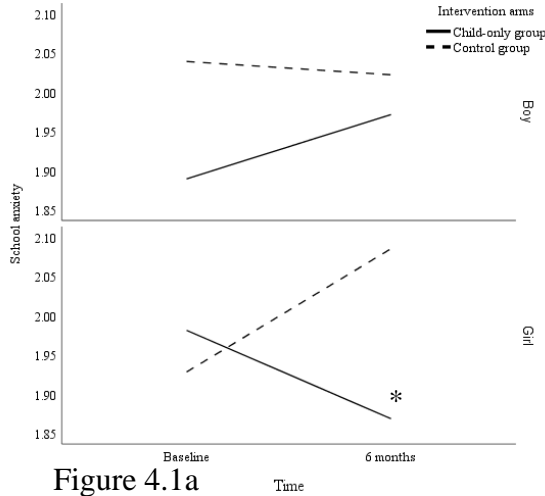* $p < .05$; ** $p < .01$; *** $p < .001$.
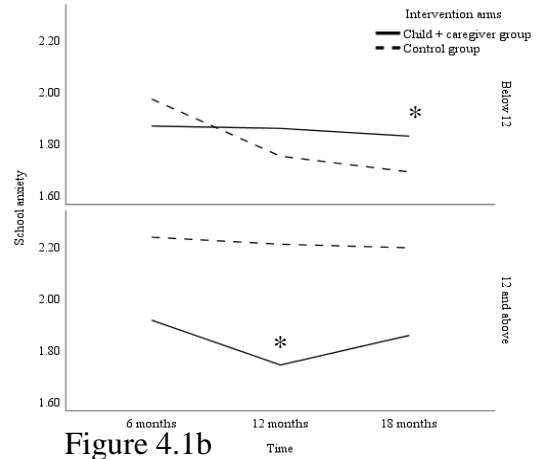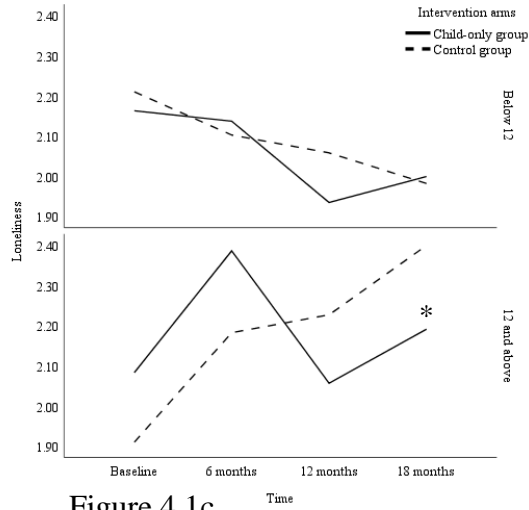
Figure 4.1a

Figure 4.1b

Figure 4.1c
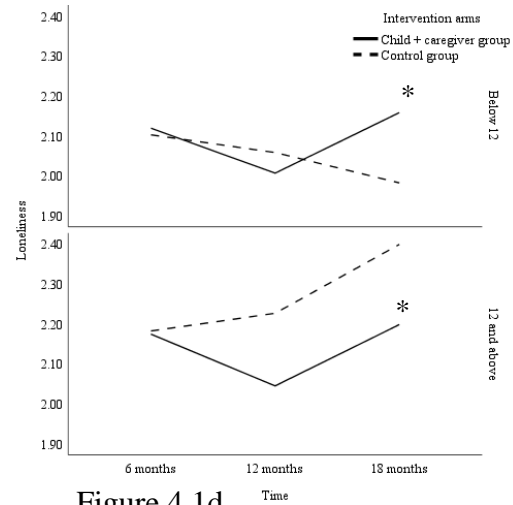
Figure 4.1d

Figure 4.1. Means for mental health outcomes across time by intervention condition

Note. Figure 4.1a represents mean scores of school anxiety from baseline to 6 months between the child-only and control groups by gender; Figure 4.1b represents mean scores of school anxiety from 6 to 18 months between the child + caregiver and control groups by age; Figure 4.1c represents mean scores of loneliness from baseline to 18 months between the child-only and control groups by age; Figure 4.1d represents the mean score of loneliness from baseline between the child + caregiver and control groups by age. Data for the child + caregiver group were depicted from 6 months from the baseline because the caregiver intervention component was delivered between 6 and 12 months.
*Significant intervention effects at $p < .05$.

4.2. Manuscript 2

Effects of a resilience-based intervention on mental health for children affected by

parental HIV: Testing mediation of emotional regulation and coping [2]

Abstract

Emotional regulation and coping have been suggested as two intrapersonal factors that may facilitate resilience and reduce mental health problems in childhood. However, few studies have examined whether emotional regulation and coping could act as the mechanisms of change underlying the effect of a resilience-based psychosocial intervention on mental health. The present study aimed to address this by analyzing data from a 4-arm cluster randomized controlled trial of the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention, a multilevel resilience-based psychosocial intervention for children affected by parental HIV ($n = 790$, 6-17 years of age). Mediators (i.e., emotional regulation, coping) were assessed at 18 months, and mental health outcomes (i.e., depressive symptoms, school anxiety, loneliness) were assessed at 18, 24, 30, and 36 months. Latent growth curve models showed that there were no impacts of the ChildCARE intervention on the intercept or slope for each mental health outcome, with an exception that the child-only intervention condition was associated with a higher intercept for school anxiety. Mediation analyses showed that the ChildCARE yielded significant improvements in positive coping, but not negative coping or emotional regulation. Emotional regulation, positive coping, and negative coping were consistently associated with the intercepts for mental health outcomes. Negative coping also significantly predicted the rates of change for mental health outcomes from 18 to 36 months. Findings provide important implications for future resilience-based intervention development and highlight the promise of interventions that aim to strengthen emotional regulation and coping in order to improve mental health for vulnerable children.

Keywords: Intervention; resilience; emotional regulation; coping; mediator

Introduction

Due to the worldwide HIV epidemic, as of 2017, about 12.2 million children had lost one or both parents to AIDS-related illness, and millions more had one or both parents living with HIV (UNICEF, 2017). These children, commonly referred to as children affected by parental HIV, have been documented to be at increased risk of experiencing poor mental health, including depression, anxiety, loneliness, and posttraumatic stress (for a review, see Chi and Li, 2013). Children affected by parental HIV, however, also show tremendous resilience, with many thriving in the face of parental HIV (Betancourt et al., 2013; Li et al., 2015).

Resilience, defined as a dynamic process to achieve positive adaptation in the face of adversity (Luthar et al., 2000), has been increasingly emphasized as a useful perspective to understand how children adapt to challenges related to parental HIV (Harrison and Li, 2018). Resilience also offers a new approach to promote mental health for children affected by parental HIV. Indeed, a few resilience-based interventions have shown promise in facilitating positive outcomes including less symptoms of depression and anxiety among children affected by parental HIV (Kumakech et al., 2009; Betancourt et al., 2017; Murphy et al., 2017), though some other evaluation studies have yielded null intervention effects (Eloff et al., 2014; Rotheram-Borus et al., 2012). Resilience-based interventions are broadly referred to interventions that aim to facilitate beneficial outcomes through strengthening intrapersonal, interpersonal, and contextual resources (Dray et al., 2017). Therefore, resilience-based interventions need to build on robust theoretical frameworks that support the underlying theoretical proposition that changes in some mechanistic factors (i.e., mechanisms of change) can translate into benefits of

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desired outcomes (Luthar and Cicchetti, 2000). To date, however, very few studies have explicitly tested the mechanisms of change underlying the effects of resilience-based interventions on mental health for children affected by parental HIV.

Testing the mechanisms of change through mediation analyses is critical for advancing the understanding of the process through which a resilience-based intervention works (MacKinnon and Luecken, 2008). First, mediation analyses provide an opportunity to empirically test the robustness of the hypothesized resilience theory behind the intervention, and the results from the analyses can lead to a better understanding of the resilience process. Furthermore, mediation analyses might be particularly useful when intervention effects are absent. Such analyses can help to identify whether a lack of intervention effect is due to no changes in mechanistic factors (i.e., failure in theory of action), an unsound theoretical framework in which changes in mechanistic factors are present but do not translate to improved outcomes (i.e., failure in theory of change), or both (O'Rourke and MacKinnon, 2018; Cleary and Stanton, 2015).

The present study, therefore, aimed to examine the possible mediators underlying a multilevel resilience-based psychosocial intervention—the *Child-Caregiver-Advocacy Resilience* (ChildCARE) intervention—for children affected by parental HIV in China (Li et al., 2017). The ChildCARE intervention was built upon a psychosocial resilience framework developed by Li et al. (2015). The framework posits that resilience encompasses dynamic interactions among multiple factors within and across individual, family, and community systems. The framework also presupposes that in order to facilitate positive adaptation, children's internal assets (e.g., emotional regulation, coping), as well as family and community supports, should be enhanced (Li et al., 2015).

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Due to the recognition that resilience involves interactions within and between multiple systems, the ChildCARE intervention provides programming at three socio-ecological levels: the child, caregiver, and community. Specifically, the child intervention component consists of ten 2-hour peer-group sessions that are designed to facilitate the development of multiple intrapersonal and interpersonal skills, including but not limited to emotional regulation and coping. The caregiver intervention component consists of five 2-hour parenting training sessions designed to enhance positive parenting skills and strengthen the self-care of caregivers of children affected by parental HIV. The community intervention component consists of monthly family visits and a series of community advocacy activities designed to promote cohesion and social support in local communities. Detailed information for each intervention session has been published elsewhere (Li et al., 2017).

Two possible important theorized mechanistic factors underlying the ChildCARE intervention are emotional regulation and coping. Indeed, the ability to regulate emotions in different situations and cope with stressors has been suggested as a central factor for developing resilience and reducing the risk of poor mental health in children (Compas et al., 2017; Troy and Mauss, 2011). Adopting the definition from Salovey and Mayer (1990), emotional regulation in the present study refers to the ability to modulate emotional responses and intensity in oneself and in others. Several studies have shown that better emotional regulation is related to fewer symptoms of depression, anxiety, and loneliness in children (Wols et al., 2015; Kim and Cicchetti, 2010; Feng et al., 2009). Moreover, a few intervention studies have found that changes in emotional regulation act as a mediator underlying the effects of psychosocial interventions on children's

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internalizing symptoms and nonsuicidal self-injury (Bjureberg et al., 2017; Fung et al., 2019).

Coping, defined as the cognitive and behavioral efforts to manage stressful situations (Folkman and Moskowitz, 2004), is another key predictor of mental health in children (Hampel and Petermann, 2006; Steele et al., 1997; Evans et al., 2015). Typically, children can adopt several types of coping strategies to deal with stress, whereas these strategies are not stable over time (Skinner and Zimmer-Gembeck, 2007). Individuals may have the ability to modify their coping strategies depending on the internal resources and the context's demands (Heffer and Willoughby, 2017). Coping strategies can be categorized into two broad types: positive coping and negative coping, regarding their associations with developmental outcomes (e.g., Heffer and Willoughby, 2017). A meta-analysis of observational studies indicated that the broad domain of positive coping was associated with fewer externalizing symptoms, whereas the broad domain of negative coping was related to more severe internalizing symptoms in children (Compas et al., 2017). The potential effects of coping on mental health were also indicated in some intervention studies (Compas et al., 2010; Tein et al., 2006). For example, a randomized controlled trial (RCT) found that a family-based intervention increased the use of positive coping strategies (e.g., acceptance, positive thinking), and increased positive coping in turn, predicted reductions in depressive symptoms among children of depressed parents (Compas et al., 2010).

The primary purpose of the present study was to examine the potential mediation effects of emotional regulation and coping on mental health intervention effects of the ChildCARE intervention. The intervention was evaluated using a 4-arm cluster RCT that

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was designed to evaluate whether three levels of the ChildCARE intervention (i.e., child, caregiver, community) yielded improved psychosocial functioning for children affected by parental HIV (Li et al., 2017b; Harrison et al., 2017; Harrison et al., 2018). Specifically, children affected by parental HIV were assigned to one of four conditions: control, child-only, child + caregiver, or child + caregiver + community and self-reported on a variety of outcomes at baseline (i.e., before intervention implementation) and every six months thereafter for a period of three years. For the current study, we examined whether children's emotional regulation and coping at 18-months would serve as mediators underlying intervention effects on several mental health outcomes. This time point was selected because 18 months was the first follow-up time point that allowed us to examine the comparison between all three intervention conditions and the control condition because of a staggered pattern of intervention delivery that was necessitated by resource constraints (see Figure 4.2). Furthermore, given that mediation analyses assume changes in mediators preceding changes in the outcomes (MacKinnon, 2008), outcomes for mental health, including depressive symptoms, school anxiety, and loneliness from 18 to 36 months, were examined. We hypothesized that changes in emotional regulation and coping at 18 months would significantly mediate the effect of the intervention on changes in mental health outcomes between 18 and 36 months.

Manuscript 1 regarding the efficacy of the ChildCARE intervention showed that the child and caregiver intervention yielded reductions in depressive symptoms and loneliness at 12 months, though these intervention effects were not sustained at 18 months. It also showed a negative intervention effect on school anxiety for children who participated in the child-only intervention component. Therefore, a second purpose of the

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present study was to extend the previous report by examining the effects of the ChildCARE intervention on mental health outcomes at later time points.

Method

Participants

Seven hundred and ninety children (408 boys, 51.6%) affected by parental HIV from central China were enrolled in the study. Children were excluded from enrollment if they were known to be HIV positive (i.e., serostatus was confirmed by caregivers or community officials). The age range of participating children was between 6 to 17 years, with about 94.4% of the sample between 8 and 15 years of age. Of the 790 children, about 12.4% had lost one (i.e., "single death") or both (i.e., "double death") biological parents to AIDS-related illness, and 87.6% had one (i.e., "single infection") or both (i.e., "double infection") parents currently living with HIV. Approximately 59.3% of children reported their fathers had no high school diploma, and 58.2% reported their mothers had no high school diploma. Also, 32.9% of fathers and 46.2% of mothers were reported to be farmers for their primary occupation.

Procedure

The recruitment procedure, randomization, intervention delivery, fidelity, and data collection have been reported elsewhere (Harrison et al., 2017; Harrison et al., 2018; Li et al., 2017). Briefly, the trial of the ChildCARE intervention was conducted during 2012-2016, following a lengthy formative development phase. Participating children and their caregivers were randomly selected from lists of families caring for children affected by parental HIV. If a family had multiple children who met the inclusion criteria, then one child was randomly invited. Children and caregivers who agreed to participate were

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randomly assigned by school clusters ($n = 45$) into the control group ($n = 195$) or one of three intervention groups (i.e., child-only [$n = 200$], child + caregiver [$n = 198$], child + caregiver + community [$n = 197$]). Of the three intervention groups, the child-only group received child intervention component only, the child + caregiver group received both child and caregiver intervention components, and the child + caregiver + community group received all three intervention components. For all groups, child and caregiver components were delivered at local schools, and the community intervention was delivered in homes and local community settings. Intervention facilitators received both standardized training and an intervention manual to ensure fidelity.

Children were asked to complete a self-administered survey before the intervention delivery (i.e., baseline). For children with difficulties in reading, trained interviewers read the items to them in a private room and recorded their responses. Follow-up surveys were administered in-person every six months until 36 months after the baseline. Children received small age-appropriate gifts as tokens of appreciation at the completion of each assessment. Children and their caregivers also provided appropriate informed consent before participation. Institutional Review Boards at Henan University, Wayne State University, and the University of South Carolina approved the study protocol.

Measures

Demographic variables. Children were asked to report information on gender, age, parental education and occupation, and family composition. They also provided information on HIV infection and AIDS-related death in the household.

Depressive symptoms. The brief 10-item *Center for Epidemiological Studies Depression Scale for Children* (Fendrich et al., 1990; Andresen et al., 1994) was used to

assess depressive symptoms. Sample items were "I felt depressed" and "I was happy (reversed coded)." Children rated the frequency of each mood or symptom occurred in the past week on a 4-point scale (coded ranging from 0 = not at all to 3 = a lot). The responses on the 10 items were added to create a sum score for each child, resulting in a possible score range of 0-30. Following the recommendation from Andresen et al. (1994), for children who had missing data for one single item, that item (i.e., fewer than 3% of the sample) was imputed using the mean score of the remaining nine items. Children with missing responses on two or more items were treated as missing. The Cronbach αs were 0.62 at baseline, 0.73 at 18 months, 0.73 at 24 months, 0.75 at 30 months, and 0.77 at 36 months.

School anxiety. The 6-item anxiety/withdrawal subscale adapted from the *Child Rating Scale* (Hightower et al., 1987) was used to measure school anxiety. Sample items were "I get upset easily at school" and "I am nervous at school." Children rated how well each item described themselves on a 4-point scale ranging from 1 = does not describe me at all to 4 = totally describes me. The responses on six items were averaged to create a mean score for each child, resulting in a possible score range of 1-4. The Cronbach αs were 0.51 at baseline, 0.74 at 18 months, 0.71 at 24 months, 0.78 at 30 months, and 0.71 at 36 months.

Loneliness. The 16-item *Loneliness Scale for Children* (Asher et al., 1984) was used to assess loneliness on a 4-point scale ranging from 1 = does not describe me at all to 4 = totally describes me. Sample items were "I do not have anyone to play with" and "I have lots of friends" (reversed coded). The responses on the 16 items were averaged to create a mean score for each child, resulting in a possible score range of 1-4. The Cronbach αs

were 0.77 at baseline, 0.84 at 18 months, 0.85 at 24 months, and 0.86 at both 30 and 36-months.

Emotional regulation. The 6-item emotional regulation subscale from the *Social Competence Scale* (Corrigan, 2002) was used to measure emotional regulation ability on a 4-point scale ranging from 1 = does not describe me at all to 4 = totally describes me. Sample items were "I can control temper when disagreement" and "I can calm down when excited." The responses on the six items were averaged to create a mean score for each child, resulting in a possible score range of 1-4. The Cronbach αs were 0.63 at baseline and 0.77 at 18 months.

Coping. Coping was assessed using a scale adapted from *Children Coping Strategies Checklist* (Ayers et al., 1996) and *Schoolagers' Coping strategies Inventory* (Ryan-Wenger, 1990). The adapted scale consisted of 12 items assessing positive coping and four items assessing negative coping. Children responded how well each item described themselves when facing difficulties or problems on a 4-point ranging from 1 = does not describe me at all to 4 = totally describes me. Sample items for positive coping were "I would tell myself that there is nothing to be worried about," "I would do something to solve the problem," and "I would find some ways (e.g., drawing, dairy writing, crying, physical activity) to relax." Negative coping consisted of four items for "acting out" behaviors, including breaking something, fighting, making fun of others, and biting nails. Confirmatory factor analysis showed that the 2-factor model (i.e., positive and negative coping) had an acceptable fit to data, $\chi^2(101) = 234.31$, CFI = .90, RMSEA = .041, with each item having a factor loading larger than 0.30. The responses on the corresponding items for positive and negative coping were, respectively, averaged to create a mean

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score for each child, resulting in a possible score range of 1-4. The Cronbach αs were 0.75 at baseline and 0.85 at 18 months for positive coping and were 0.66 at baseline and 0.70 at 18 months for negative coping.

Data analyses

The latent growth curve model (LGCM) was performed to test the direct and indirect effects of the ChildCARE intervention on changes in mental health outcomes between 18 and 36 months via the following steps. First, both unconditional linear and quadratic models were separately performed for depressive symptoms, school anxiety, and loneliness. Time was rescaled to be 0, 1, 2, and 3, and thus, the intercept of each LGCM reflected the mean score for the mental health measure at 18 months. Models were considered to have an acceptable fit to data if the comparative fit index (CFI) ≥ 0.90 and the root mean squared error of approximation (RMSEA) ≤ 0.08 and a good fit if CFI ≥ 0.95 and RMSEA ≤ 0.06 (Hu and Bentler, 1999). Second, the model fits between linear and quadratic models were compared using the Akaike information criterion (AIC) and Bayesian information criterion (BIC). Models with both smaller AIC and BIC would be selected as the final unconditional LGCMs. Third, to examine the intervention effects, the intervention conditions represented by three dummy variables were included as the predictors of the intercept and slope in the model. These dummy variables allowed us to examine the effects of each of the three intervention conditions (i.e., child-only, child + caregiver, child + caregiver + community) on changes in mental health outcomes. Baseline mental health outcomes were included as covariates in each model.

Finally, the mediation models in the LGCM framework were performed to test the mediating effects of emotional regulation and coping at 18 months on the association

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between the intervention conditions and changes in mental health outcomes. The models were separately performed for emotional regulation and coping. For each mediation model, the intervention conditions and the mediator at baseline were included as predictors for the mediator at 18 months. Mediators at 18 months, the intervention conditions, and mental health outcomes at baseline were included in the model as predictors of the intercept and slope. The indirect effect was tested using the product of coefficients recommended by MacKinnon et al. (2002).

All models were performed using the robust maximum likelihood estimator in Mplus 7.0 (Muthén and Muthén, 2012), with cluster-adjusted standard errors to account for school clustering (McNeish et al., 2017). The LGCM allowed missing data at one or more time points, and the missing data was handled using full information maximum likelihood method. The assumption of missing at completely random was not rejected (p = .25), using a nonparametric test of homoscedasticity (Jamshidian and Jalal, 2010). Baseline demographic variables, including age and the number of HIV infection in the household, were included as covariates in the models due to previously reported inequivalence by intervention assignment (Li et al., 2017).

Results

Participant characteristics

There were no differences in baseline mediators or mental health outcomes by intervention assignment (ps > .05, see Table 4.8). The demographic characteristics for children and attrition rates have been reported elsewhere (Harrison et al., 2018; Li et al., 2017), with the detailed information presenting in Table 4.1 and the attrition diagram presenting in Figure 4.3. The cumulative rates of children lost to follow-up were 5.4% at

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6 months, 13.2% at 12 months, 15.9% at 18 months, 22.7% at 24 months, 24.8% at 30 months, and 39.0% at 36 months.

Ninety-seven children did not provide data on mental health outcomes at any of the four tested follow-ups in this study and were excluded from further analyses. Attrition analyses showed that there were no significant differences in variables of interest at baseline between the intervention and control groups among these children who excluded from further analyses (see Table 4.9).

Unconditional latent growth curve models

Unconditional LGCMs for depressive symptoms showed that both linear and quadratic models had good fits to data (linear: $\chi^2[8] = 12.86$, CFI = .98, RMSEA = .03; quadratic: $\chi^2[4] = 2.33$, CFI = 1.00, RMSEA = .00). Comparisons of AIC and BIC showed that the linear LGCM had a relatively larger AIC (13421 vs. 13413) but a smaller BIC (13448 vs. 13458). Therefore, the linear LGCM was selected. The means of intercept and slope were 9.60 ($p < .001$) and -0.30 ($p = .004$), respectively. The variances of the intercept and slope were all significant at $p < .001$.

Similarly, the unconditional LGCMs showed that both linear and quadric models for school anxiety fit the data well (linear: $\chi^2[8] = 15.36$, CFI = .98, RMSEA = .04; quadratic: $\chi^2[4] = 3.16$, CFI = 1.00, RMSEA = .00). Results on AIC and BIC showed that the linear model had a larger AIC (3666 vs. 3657) but a smaller BIC (3693 vs. 3703) than the quadratic model. Therefore, the linear model was selected, with mean values of 1.78 ($p < .001$) for the intercept and -0.02 ($p = .14$) for the slope. The variances of the intercept and slope were significant at $p < .001$.

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The unconditional LGCMs for loneliness showed that the linear model had a poor fit to data, $\chi^2(8) = 59.10$, CFI = .91, RMSEA = .10, whereas the quadratic model had an acceptable fit to data, $\chi^2(4) = 21.14$, CFI = .97, RMSEA = .08). The linear model had both a larger AIC (2857 vs. 2816) and BIC (2884 vs. 2862) than the quadratic model. Therefore, the quadratic model was selected. The means of the intercept, linear, and quadratic slopes were 2.08 ($p < .001$), -0.21($p < .001$), and 0.05 ($p < .001$), respectively. Given that the variance of the quadratic slope is small and nonsignificant (value = 0.002, $p = .43$), the variance of the quadratic slope was fixed to zero, resulting a final model with a good fit to data, $\chi^2(7) = 26.24$, CFI = .97, RMSEA = .06, AIC = 2816, BIC = 2847. The variances of the intercept and linear slope were all significant at $p < .01$.

Intervention effects

The model for depressive symptoms resulted in a good fit to data, $\chi^2(20) = 22.31$, CFI = .99, RMSEA = .01. The intervention conditions were not associated with the intercept or the slope for depressive symptoms (see Table 4.10). The model for school anxiety also had a good fit the data, $\chi^2(20) = 46.13$, CFI = .94, RMSEA = .04. There were no significant associations between the intervention conditions and the intercept or the slope, with the exception that there was a positive association between the child-only intervention condition and the intercept ($b = .25$, $SE = 0.08$, $p = .003$). That was, children in the child-only group were more likely to report increases in school anxiety at 18 months than those in the control group. In addition, the model for loneliness provided a good fit to data, $\chi^2(19) = 37.28$, CFI = .97, RMSEA = .04. The intervention conditions were not related to the intercept or slope (ps > .05).

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Indirect intervention effects through emotional regulation and coping

Emotional regulation. The mediation models for each of three mental health outcomes resulted in acceptable or good fits to data, $\chi^2(27) = 37.36$, CFI = .97, RMSEA = .02 for depressive symptoms; $\chi^2(27) = 62.13$, CFI = .93, RMSEA = .04 for school anxiety; and $\chi^2(26) = 68.14$, CFI = .95, RMSEA = .05 for loneliness. In all three models, the intervention conditions did not predict emotional regulation at 18 months, after controlling for baseline emotional regulation. Emotional regulation at 18 months, however, was associated with the intercepts for depressive symptoms ($b = -1.39$, $SE = 0.39$, $p < .001$, see Figure 4.4a), school anxiety ($b = -.15$, $SE = 0.02$, $p < .001$, see Figure 4.4b), and loneliness ($b = -.29$, $SE = 0.03$, $p < .001$, see Figure 4.4c). There were no associations between emotional regulation at 18 months and the slopes for depressive symptoms, ($b = -.07$, $SE = 0.15$, $p = .66$), school anxiety ($b = .01$, $SE = 0.01$, $p = .41$), or loneliness ($b = .02$, $SE = 0.01$, $p = .10$). There were no any statistically significant indirect effects of the intervention on intercepts or slopes for mental health outcomes through emotional regulation at 18 months ($ps > .05$).

Coping. The models for each of mental health outcomes provided acceptable or good fits to data, $\chi^2(36) = 54.59$, CFI = .96, RMSEA = .03 for depressive symptoms; $\chi^2(36) = 104.60$, CFI = .90, RMSEA = .05 for school anxiety; and $\chi^2(35) = 92.97$, CFI = .94, RMSEA = .05 for loneliness. In all models, the child-only and child + caregiver + community conditions were associated with positive coping but not with negative coping at 18 months, controlling for baseline positive and negative coping. Positive coping at 18 months, in turn, was negatively associated with the intercepts for depressive symptoms ($b = -.96$, $SE = 0.40$, $p = .017$, see Figure 4.5a), school anxiety ($b = -.09$, $SE = 0.03$,

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p = .002, see Figure 4.5b), and loneliness (b = -.26, SE = 0.03, p < .001, see Figure 4.5c).

Positive coping, however, was not related to the slopes for any mental health outcomes (b = -.16, SE = 0.19, p = .39 for depressive symptoms; b = -.02, SE = 0.02, p = .26 for school anxiety; b = .00, SE = 0.02, p = .84 for loneliness). Negative coping was associated with both the intercept and slope for depressive symptoms (b = 2.31, SE = 0.30, p < .001; b = -.59, SE = 0.13, p < .001; respectively). Negative coping was also related to both the intercepts and slopes for school anxiety (b = .29, SE = 0.03, p < .001; b = -.06, SE = 0.02, p < .001; respectively) and loneliness (b = .26, SE = 0.02, p < .001; b = -.04, SE = 0.01, p = .001, respectively). Analyses of indirect effects found that there was an indirect effect of the intervention (i.e., child + caregiver + community) on the intercept of school anxiety via positive coping at 18 months (indirect effect = -0.02, SE = .01, p = .017). The indirect effects of the intervention (i.e., child-only, child + caregiver + community) on the intercept of loneliness through positive coping at 18 months were also statistically significant (indirect effect = -0.03, SE = .02, p = .023 for child-only; indirect effect = -0.06, SE = .02, p = .002 for child + caregiver + community). No other indirect effects of the intervention on the intercepts or slopes for mental health outcomes via positive or negative coping at 18 months were found to be statistically significant (ps > .05).

Discussion

The current study examined the potential mediation roles of emotional regulation and coping in the effects of the ChildCARE intervention on mental health outcomes among children affected by parental HIV. Results showed that the ChildCARE intervention was not associated with changes in mental health outcomes from 18 to 36 months.

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Furthermore, the ChildCARE intervention did not yield significant changes in the mediators at 18 months, with the exception of positive coping. Mediators at 18 months, however, were significantly associated with the intercepts (i.e., mean scores at 18 months) for depressive symptoms, school anxiety, and loneliness. Negative coping also significantly predicted the rates of change for depressive symptoms, school anxiety, and loneliness from 18 to 36 months.

Our hypotheses were partly supported by showing significant indirect effects of the intervention on school anxiety and loneliness via positive coping, whereas there were no indirect effects through negative coping or emotional regulation, possibly due to the nonsignificant links from the intervention to the mediators. The results indicated that children enrolled in both the child and child + caregiver + community conditions displayed larger increases in positive coping than the control group at 18 months, whereas similar benefits were not observed for children in the child + caregiver condition. The reasons for this null result remain unknown. It has been previously suggested that enhancing parenting skills could increase children's coping capacities (Vélez et al., 2011; Dumas et al., 2011)— yet this was not clearly demonstrated in the present study. Furthermore, our study did not show significant effects of the intervention in reducing negative coping at 18 months, suggesting that increases in the adoption of positive coping practices may not necessarily be concomitant with decreases in the use of negative coping. This finding may indicate the challenges in reducing negative coping among children affected by parental HIV. In the face of overwhelming adversity, children may be more likely to employ negative coping strategies, and negative coping, in turn, may be reinforced due to its temporary relief of distress, making it potentially more

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challenging to break patterns of negative coping (Wadsworth, 2015; Zimmer-Gembeck and Skinner, 2016). Also, our results did not show any significant improvements in emotional regulation at 18 months in any of the intervention groups. A possible explanation for the lack of changes might be due to the brief nature of the intervention (Harrison et al., 2018). A few curriculum-based sessions (e.g., 10 sessions of the child component and five sessions of the caregiver component) may be too brief to result in sustained changes in emotional regulation for vulnerable children. A previous evaluation of the efficacy of the ChildCARE intervention has demonstrated improvements in emotional regulation at 12 months for children enrolling in the child + caregiver group (Li et al., 2017).

Although the intervention efforts to change the hypothesized mediators at 18 months were largely not observed, this study indicated that greater emotional regulation, more use of positive coping, and less use of negative coping contributed to lower depressive symptoms, school anxiety, and loneliness at 18 months. These results are in line with the evidence from a meta-analytic review showing the consistent relationships of emotional regulation and coping with psychopathology from cross-sectional studies (Compas et al., 2017). Also, our results provide preliminary evidence to support the soundness of the theoretical framework underlying the ChildCARE intervention, suggesting the critical roles of emotional regulation and coping playing in the process of resilience for children affected by parental HIV (Li et al., 2015). The findings also highlight the promise of interventions involving coping and emotional regulation skill building in improving mental health for vulnerable children.

Notably, we observed that negative coping, but not positive coping or emotional regulation, was associated with the rates of change (i.e., the slopes) for mental health outcomes, suggesting that negative coping may be a more robust predictor for long-term wellbeing. This result corroborates previous evidence demonstrating a more consistent relationship between negative coping, such as avoidance, and psychopathology than the relationships between positive coping or emotional regulation and psychopathology in longitudinal studies (Compas et al., 2017). One possible explanation is that the usage of certain types of coping strategies (e.g., acting out behaviors) may be particularly harmful in the long run. For example, children affected by parental HIV are at increased risk of experiencing bullying (Cluver and Orkin, 2009). When children use acting out behaviors (e.g., fighting) as a coping strategy to cope with bullying, it may amplify their risk of being bullied in a later time and therefore increase the likelihood of experiencing poor mental health over time (Cooley et al., 2017; Sheppard et al., 2019).

Unsurprisingly, we did not observe direct intervention effects on the rates of change for mental health outcomes from 18 to 36 months, given that the intervention effects on mental health outcomes have been demonstrated to be not sustained at 18 months in Manuscript 1. The present study suggests that the lack of intervention effects is possibly due to the lack of significant changes in targeted mechanistic factors, including emotional regulation and negative coping at 18 months. Moreover, the child-only intervention condition was associated with the intercept but not the slope for school anxiety, indicating that the previously reported negative intervention effect on school anxiety at 18 months was temporary.

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Importantly, our study did not indicate significant long-term benefits of the ChildCARE intervention on mental health among children affected by parental HIV, with similar results observed for the three intervention conditions. However, this result does not suggest downplaying the importance of multilevel resilience-based interventions for children affected by parental HIV, particularly given the complex challenges they may experience (Salaam, 2004). Instead, it may highlight the potential challenges in improving mental health for children who experience multifaceted adversities in resource-limited settings. Intensive interventions, as well as having the ability to build the capacity at school and community levels to address children's ongoing needs, may be necessary to make a sustained improvement in mental health, whereas the scarce resources commonly make such interventions difficult in practice (Fazel et al., 2014).

Limitations

Several limitations should be considered when interpreting our results. First, all measures used in our study were self-report. Also, the brief measure of the overall emotional regulation ability limited the possibilities to explore the mediation roles of different emotional regulation strategies in the intervention effects for mental health. Furthermore, the items used in the current study to measure negative coping may not have been sufficiently broad to capture other strategies that are also commonly conceptualized as negative coping, such as avoidance (Zimmer-Gembeck and Skinner, 2016). Second, although missing data at some time points were allowed and handled using full information maximum likelihood method in the LGCM, higher attrition rates in the child-only and control groups than the other two groups might have affected the results. Our attrition analyses showed that there were no differences in baseline variables

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of interest across the four groups among children who were lost to follow-ups. However, this result did not rule out the possibility that they might differ on some unmeasured factors relating to mental health.

Despite these limitations, the present study extends previous studies that primarily focused on short-term intervention effects by examining the ChildCARE intervention effects up to 36 months after the baseline. Our results highlight the challenges for resilience-based psychosocial interventions such as the ChildCARE intervention in producing meaningful, long-term changes in mental health among children affected by parental HIV. Mediation analyses in the present study further showed that a lack of intervention effects might partly due to the fact that ChildCARE did not cause sustained changes in the mechanistic factors, including emotional regulation and coping. On the one hand, our results suggest that a brief nature of resilience-based psychosocial intervention may not be robust enough to strengthen children's emotional regulation and coping skills for children affected by parental HIV, who are at risk of experiencing complex challenges. Modifications in the theory of action, such as adding booster sessions, are suggested to take for the implementation of the ChildCARE intervention in the future to obtain more sustained effects. On the other hand, our results provide preliminary evidence to support the mechanism of change underlying the ChildCARE intervention by showing consistent associations between emotional regulation and coping and mental health outcomes. These findings show the promise of resilience-based interventions that aim to equip vulnerable children with effective emotional regulation and coping skills, in order to promote better mental health functioning across their development.

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Table 4.8. Means and standard deviations for mediators and mental health outcomes by intervention assignment

Variables	Overall	Control	Intervention groups			p
			Child-only	Child + Caregiver	Child + caregiver + community	
Emotional regulation						
Baseline	2.73(0.56)	2.80(0.58)	2.73(0.51)	2.68(0.55)	2.72(0.61)	.19
18 months	2.76(0.64)	2.72(0.64)	2.77(0.57)	2.72(0.63)	2.83(0.70)	-
Positive coping						
Baseline	2.79(0.50)	2.86(0.49)	2.77(0.50)	2.76(0.44)	2.76(0.58)	.19
18 months	2.80(0.55)	2.71(0.54)	2.85(0.53)	2.71(0.56)	2.91(0.56)	-
Negative coping						
Baseline	1.70(0.71)	1.77(0.74)	1.65(0.71)	1.73(0.77)	1.65(0.62)	.27
18 months	1.85(0.74)	1.86(0.76)	1.91(0.78)	1.89(0.71)	1.77(0.73)	-
Depressive symptoms						
Baseline	10.36(4.35)	10.70(4.42)	10.16(4.29)	10.51(4.02)	10.09(4.67)	.47
18 months	9.82(4.80)	9.67(4.92)	10.41(4.61)	10.24(4.49)	8.94(5.06)	-
24 months	8.93(4.51)	8.88(4.62)	9.25(4.55)	9.17(4.44)	8.42(4.44)	-
30 months	8.95(4.60)	8.58(4.93)	9.24(4.54)	9.47(4.48)	8.46(4.47)	-
36 months	8.72(4.61)	8.78(4.83)	8.80(4.85)	9.24(4.19)	8.12(4.63)	-
School anxiety						
Baseline	1.95(0.56)	1.99(0.53)	1.89(0.56)	1.97(0.54)	1.94(0.59)	.32
18 months	1.80(0.62)	1.81(0.65)	1.91(0.65)	1.83(0.61)	1.66(0.55)	-
24 months	1.72(0.58)	1.68(0.58)	1.82(0.59)	1.75(0.56)	1.64(0.56)	-
30 months	1.71(0.58)	1.64(0.59)	1.78(0.63)	1.79(0.53)	1.62(0.57)	-
36 months	1.72(0.56)	1.74(0.58)	1.72(0.60)	1.76(0.57)	1.66(0.51)	-
Loneliness						
Baseline	2.13(0.47)	2.11(0.49)	2.10(0.47)	2.15(0.42)	2.16(0.48)	.54
18 months	2.09(0.52)	2.08(0.54)	2.08(0.51)	2.17(0.44)	2.03(0.56)	-
24 months	1.87(0.51)	1.88(0.52)	1.88(0.53)	1.90(0.49)	1.82(0.52)	-

30 months	1.89(0.51)	1.87(0.53)	1.88(0.52)	1.95(0.49)	1.84(0.51)	-
36 months	1.85(0.53)	1.83(0.59)	1.79(0.49)	1.95(0.50)	1.80(0.50)	-

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Table 4.9. Differences in variables of interest at baseline among children with missing data at follow-ups by intervention assignment

	Overall	Control	Intervention groups			p
			Child-only	Child + caregiver	Child + caregiver + community	
Attrition rates[a]	97(12.3%)	37(19.0%)	28(14.0%)	15(7.6%)	17(8.6%)	
Baseline variables						
Depressive symptoms	-	10.69(3.95)	9.89(5.25)	11.40(4.08)	12.00(3.46)	.45
School anxiety	-	2.00(0.55)	2.00(0.60)	2.07(0.44)	2.14(0.49)	.81
Loneliness	-	1.97(0.47)	2.14(0.56)	2.08(0.38)	2.33(0.44)	.12
Emotional regulation		2.74(0.48)	2.71(0.46)	2.61(0.67)	2.63(0.60)	.82
Positive coping		2.83(0.47)	2.82(0.37)	2.65(0.48)	2.63(0.37)	.27
Negative coping		1.86(0.79)	1.72(0.65)	1.94(0.80)	1.67(0.58)	.65

Note. [a] Defined as children who did not provide data on mental health outcomes at any of the four follow-ups.

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Table 4.10. Effects of the intervention on changes in mental health outcomes

Predictors	Depressive symptoms		School anxiety		Loneliness	
	Intercept	slope	Intercept	slope	Intercept	slope
Child-only	1.03(.55)	-.13(.26)	.25(.08)**	-.04(.04)	.04(.06)	.01(.02)
Child + caregiver	1.02(.84)	-.07(.39)	.20(.11)	-.02(.04)	.09(.08)	.02(.03)
Child + caregiver + community	-.04(.85)	.03(.28)	.02(.09)	.01(.03)	-.02(.09)	.02(.03)
# of infection	.29(.19)	-.06(.08)	.06(.02)*	-.00(.01)	.02(.02)	.01(.01)
Age	.35(.15)*	-.04(.06)	.05(.02)*	.00(.01)	.03(.02)*	.00(.01)
Baseline depressive symptoms	.17(.04)***	.01(.02)	-	-	-	-
Baseline school anxiety	-	-	.19(.05)***	-.02(.02)	-	-
Baseline loneliness	-	-	-	-	.38(.05)***	-.03(.02)

Note. Unstandardized coefficients *b*(*SE*) were displayed. The variance of the quadratic slope in loneliness model was fixed to zero with no predictors.

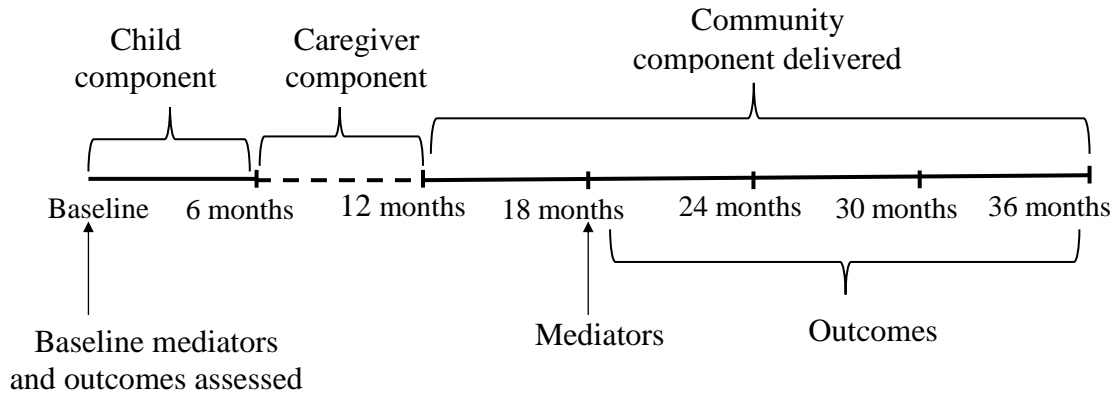*$p < .05$, **$p < .01$, *** $p < .001$.

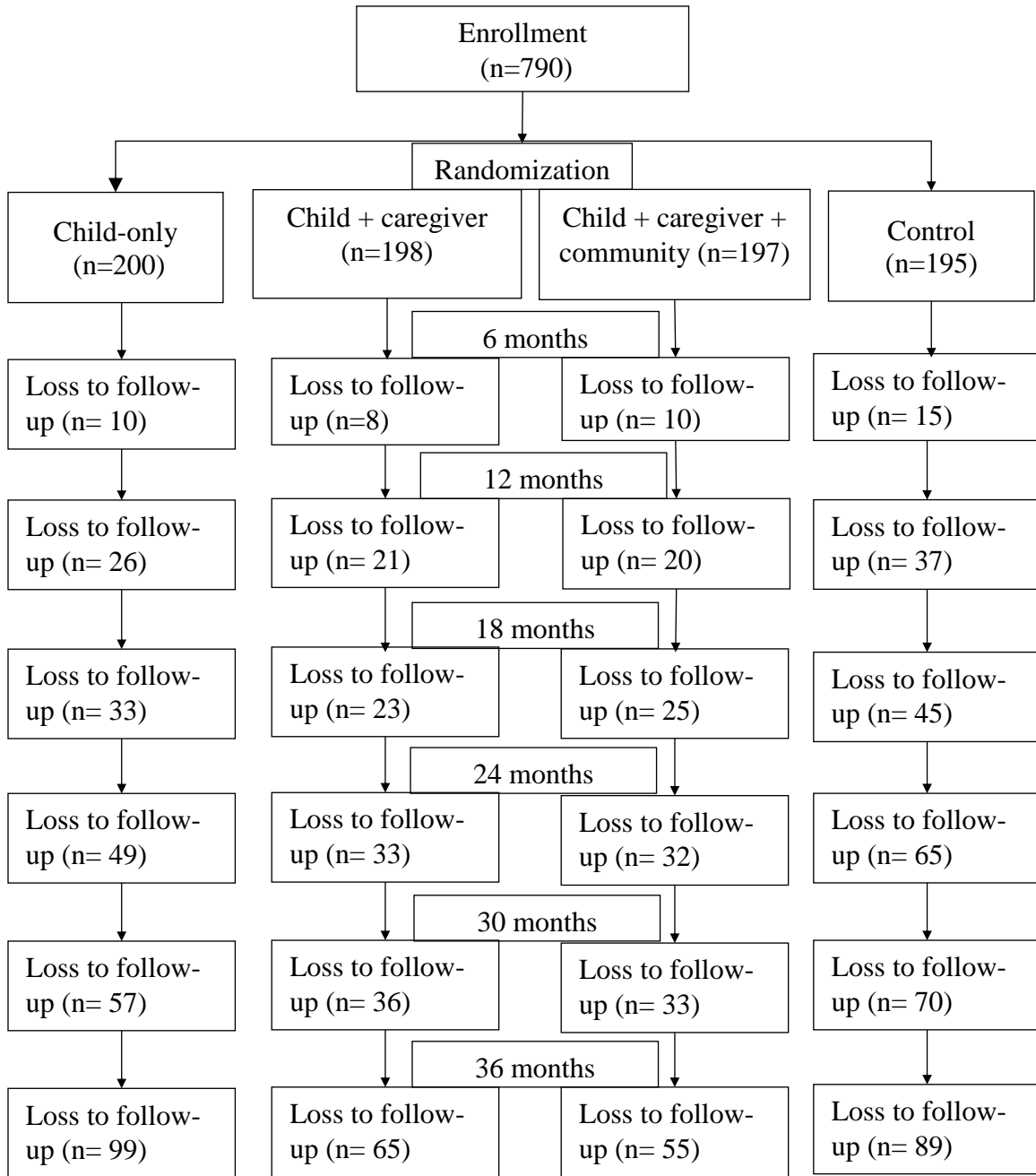Figure 4.2. The timeline of the intervention delivery and assessment in the present study

Figure 4.3. Attrition flow chart

Figure 4.4a

.02
.96
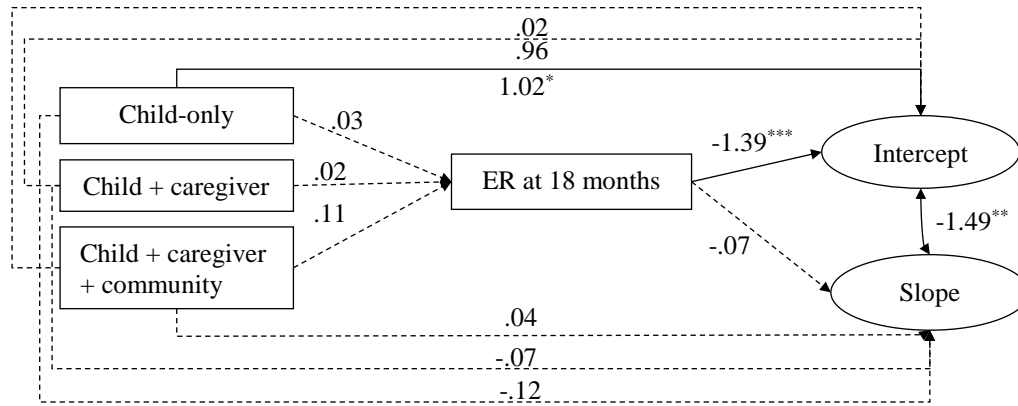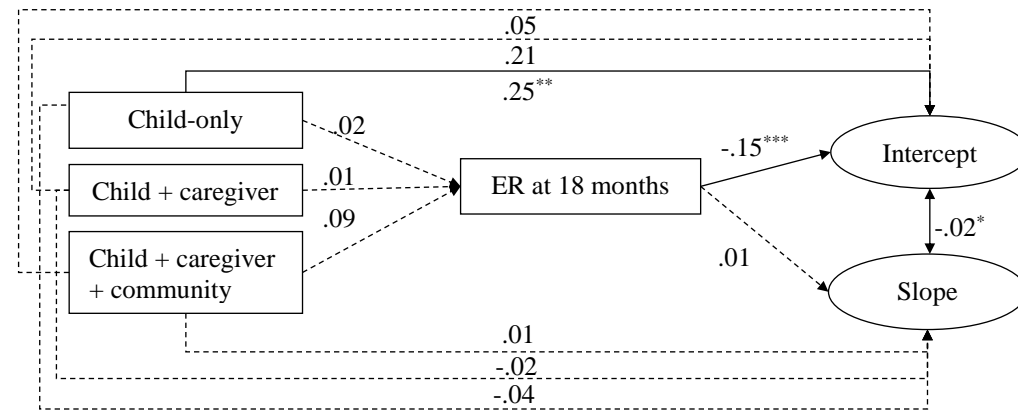1.02*

Child-only — .03 → ER at 18 months
Child + caregiver — .02
Child + caregiver + community — .11

ER at 18 months — -1.39*** → Intercept
ER at 18 months — -.07 → Slope
Intercept ↔ Slope: -1.49**

.04
-.07
-.12

Figure 4.4b

.05
.21
.25**

Child-only — .02 → ER at 18 months
Child + caregiver — .01
Child + caregiver + community — .09

ER at 18 months — -.15*** → Intercept
ER at 18 months — .01 → Slope
Intercept ↔ Slope: -.02*

.01
-.02
-.04

Figure 4.4c

-.00
.08
.04

Child-only — .01 → ER at 18 months
Child + caregiver — .01
Child + caregiver + community — .09

ER at 18 months — -.29*** → Intercept
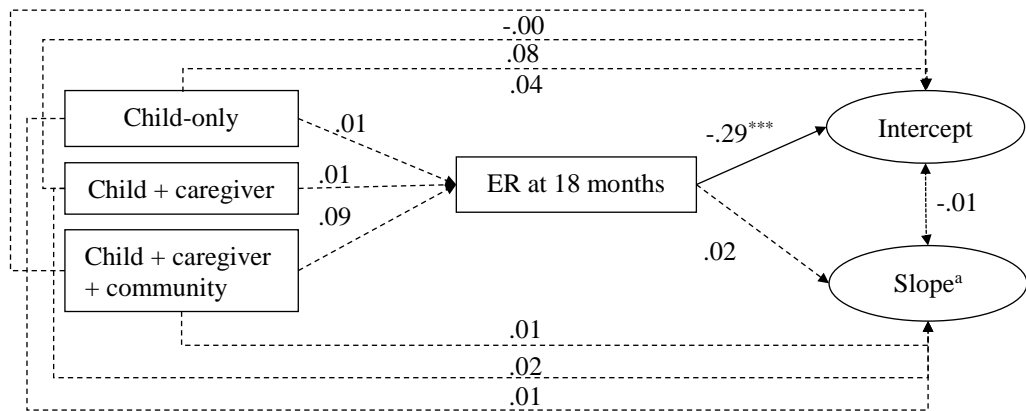ER at 18 months — .02 → Slope[a]
Intercept ↔ Slope[a]: -.01

.01
.02
.01

Figure 4.4. Mediation models of emotional regulation (ER) for mental health outcomes.

Note. Figure 4.4a for depressive symptoms; Figure 4.4b for school anxiety; Figure 4.4c for loneliness. Unstandardized coefficients were displayed. Covariates, including baseline ER and mental health outcomes, age, and the number of HIV infection in the household, were included in the model but not displayed for simplicity. Dash lines represent statistically nonsignificant ($p > .05$).
[a] A quadratic slope was modeled but not displayed for simplicity.
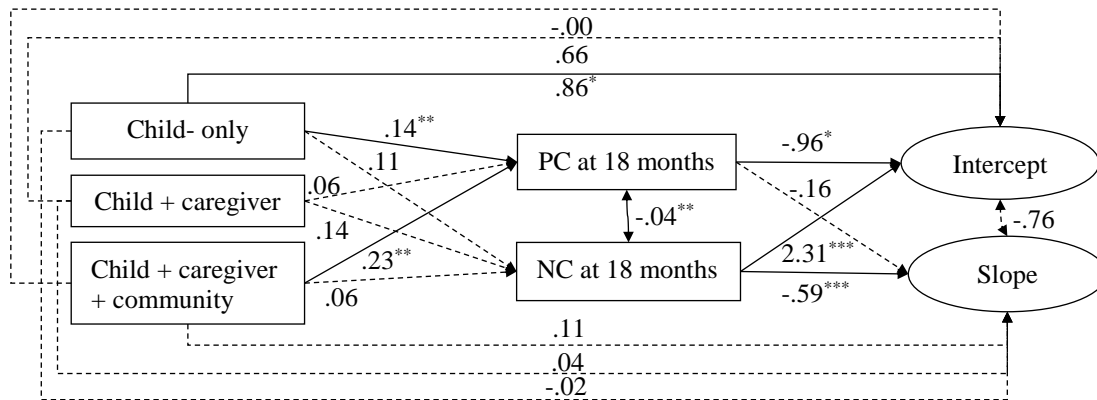$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$.
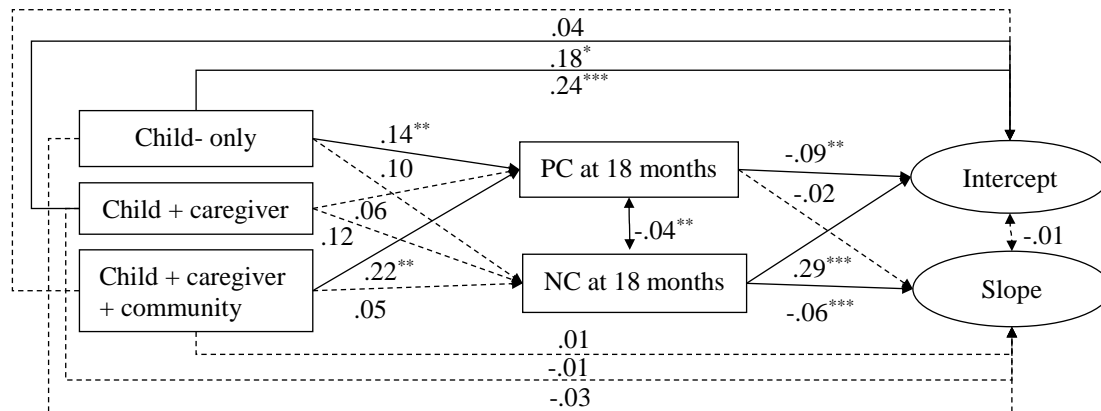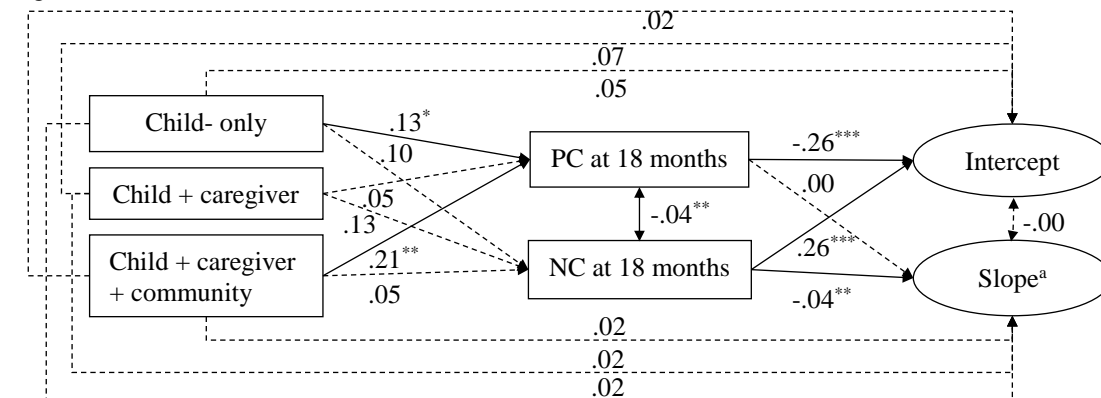
Figure 4.5. Mediation models of positive coping (PC) and negative coping (NC) for mental health outcomes.

Note. Figure 4.5a for depressive symptoms; Figure 4.5b for school anxiety; Figure 4.5c for loneliness. Unstandardized coefficients were displayed. Covariates, including baseline PC and NC and mental health outcomes, age, and the number of HIV infection in the household, were included in the model but not displayed for simplicity. Dash lines represent statistically nonsignificant ($p > .05$).

[a] A quadratic slope was modeled but not displayed for simplicity.

$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$

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Chapter 5

Summary, Implication, and Recommendations

5.1. Summary of the Findings

Children affected by parental HIV commonly experience complex challenges, putting them at increased risk of experiencing poor mental health outcomes (Chi and Li, 2013; Goldberg and Short, 2016). These children, however, also develop tremendous resilience despite adversity (Li et al., 2015). Interventions targeting resilience-related factors at multiple systems have been suggested as a promising way to improve mental health for this group (Betancourt et al., 2013). Few comprehensive multilevel interventions, however, have been developed for children affected by parental HIV, and the effectiveness of such interventions on mental health has not been sufficiently examined. The overall purpose of this research was to extend previous research through examining the efficacy of a multilevel resilience-based intervention (i.e., the ChildCARE intervention) on selected mental health outcomes as well as testing the potential moderators and mediators underlying the intervention effects on mental health.

Results on the short-term efficacy (i.e., up to 18 months after the baseline) of the ChildCARE intervention showed that the intervention did not yield significant changes in depressive symptoms, school anxiety, or loneliness in the child-only group at 6, 12, or 18 months, with an exception of a negative intervention effect on school anxiety at 18 months (i.e., increased symptoms of school anxiety). In contrast, significant more reductions in depressive symptoms and loneliness were observed in the child + caregiver

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group at 12 months, compared to the control group. However, the observed intervention effects were not sustained at 18 months. In addition, children who received the community component that was implemented after 12 months did not show significant improvements in any of the mental health outcomes when compared to the control group at 18 months. These results extend the previous studies regarding the impacts of the ChildCARE intervention on school outcomes by suggesting that some combinations of the ChildCARE intervention components may yield benefits to mental health (Harrison et al., 2017; Harrison et al., 2018).

The potential moderation effects of gender and age were examined for the short-term effects of the ChildCARE intervention on mental health outcomes. Results indicated that the intervention resulted in a larger reduction in school anxiety for girls in the child-only group than girls in the control group at 6 months, whereas boys between these two groups did not show significantly different changes in school anxiety from baseline to 6 months. However, a definitive conclusion may not able to make regarding gender differences in the effects of the ChildCARE intervention, given that the significant gender differences were limited to school anxiety at 6 months. Age differences in the intervention effects on mental health outcomes were also observed. Older children (e.g., 12 years and older) were more likely to gain benefits from the intervention to reduce school anxiety and loneliness than their younger counterparts (e.g., below 12 years old). These results are in line with the previous study showing greater effects of another resilience-based intervention on problem behaviors for older children affected by parental HIV in China than the younger counterparts (Li et al., 2017a). The results suggest that older children may respond more favorably to the ChildCARE intervention than younger children.

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The examination of the intervention effects at later time points using the LGCM indicated that children in both intervention and control groups showed a significant decline in depressive symptoms, school anxiety, and loneliness from 18 to 36 months. However, compared to the control group, none of the three intervention conditions (child-only, child + caregiver, child + caregiver + community) were significantly associated with faster rates of decline in mental health outcomes over time. The results suggest that the ChildCARE intervention, at its current form, did not yield significantly sustained improvements in the mental health outcomes of interest for children affected by parental HIV. The results further indicated that there were no significant additive intervention component effects on mental health outcomes at later time points.

Results from mediation analyses largely did not support the possible mediation role of emotional regulation and coping in the mental health intervention effects, possibly due to the nonsignificant links from the intervention conditions to the mediator at 18 months. Specifically, the ChildCARE intervention led to significant improvement in positive coping, but not negative coping or emotional regulation at 18 months. Emotional regulation, positive coping, and negative coping at 18 months, however, were all consistently associated with the intercept for each mental health outcome. Negative coping also significantly predicted the rates of change (i.e., the slopes) for mental health outcomes from 18 to 36 months. The consistent associations of emotional regulation and coping with mental health outcomes, nevertheless, partly support the soundness of the hypothesized resilience framework underlying the ChildCARE intervention (Li et al., 2015).

5.2. Strengths and Limitations

This research has multiple important strengths. First, to the best of our knowledge, this research is one of the first studies examining the efficacy of a multilevel resilience-based intervention on mental health outcomes among children affected by parental HIV. Although the promise of multilevel resilience-based interventions has been recognized in previous research (Li et al., 2015; Betancourt et al., 2013), few studies have been explicitly examined the potential benefits of such interventions for mental health for this group. Second, the use of a 4-arm RCT design in this research not only allows for a rigorous evaluation of the efficacy of the ChildCARE intervention but also allows to examine the potential additive benefits of the layering intervention components. Testing such additive benefits could provide further evidence to determine whether a multilevel resilience-based intervention would be more effective than a single-level (e.g., child-targeted) intervention.

Third, the inclusion of a 36-month assessment of the outcomes provides an opportunity to examine both the short-term and long-term efficacy of the ChildCARE intervention. The present results may be particularly important, given that the potential long-term effects of resilience-based interventions on mental health outcomes have not been fully examined (Dray et al., 2017). Fourth, this research extends previous research by examining potential moderators and mediators underlying the intervention effects on mental health. Resilience-based interventions are commonly theory-driven, whereas few studies have explicitly examined the theorized mechanisms of change underlying the effect of a resilience-based intervention on children's mental health (Dray et al., 2017). In addition, testing the potential moderators in the ChildCARE intervention effects can

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provide evidence to suggest whether there are subgroups who benefit more from the intervention. Identifying these subgroups, in turn, can help to tailor interventions to enhance their impacts on mental health in the future.

Despite these strengths, interpretation of the present findings should be done cautiously due to several limitations. First, the evaluation of the efficacy of the ChildCARE intervention on mental health outcomes relied on self-report data. Recall bias and social desirability bias may have affected the results, though the inclusion of a control group may mitigate this issue. Also, standardized clinical interviews for mental health disorders were not available in this research, limiting the ability to determine whether the observed decreases in some mental health outcomes (e.g., depressive symptoms) had a clinically meaningful improvement. Such interviews also help to reduce concerns about self-report bias, as well as providing data to assess the validity of self-reported mental health measures used in the present research. Furthermore, some measures for mental health outcomes (e.g., school anxiety) were not validated in the Chinese cultural context and showed low internal consistency at baseline. Second, the use of cluster randomization resulted in some inequivalence in demographic variables between the intervention and control groups, which may introduce bias to the intervention effects.

Third, a relatively large attrition rate was observed for all groups in later follow-ups (e.g., 36-month), with the control group having a higher attrition rate. A higher attrition rate in the control group may be due to the lack of perceived benefits for participating in the research. However, an unbalanced attrition rate may result in some inequivalence between the intervention and control groups, though attrition analyses indicated no

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differences in baseline mental health outcomes between the intervention and control

groups among children who were lost to follow-ups. Inequivalence in some unmeasured

factors relating to mental health may occur and affect the results. Lastly, due to the nature

of the psychosocial intervention, intervention facilitators and children were not able to be

blinded to intervention assignment. Lack of blindness to intervention conditions may

have affected facilitators' and children's behaviors in the trial, as well as children's

response to self-reported outcome measures (Karanicolas et al., 2010).

5.3. Implication

Findings of the present research provide several implications for public health

research and practices among children affected by parental HIV. Present results highlight

the potential benefits of comprehensive resilience-based interventions in facilitating

positive adaptation, including improved mental health, for children affected by parental

HIV in resource-limited settings. Our results underscore the need to shift psychosocial

interventions that targeted resilience-related factors at one single level (e.g., child) to be

more holistic and to seek changes in multiple ecological systems, including the child,

family, and community. Our findings, however, also highlight the challenges in

improving mental health for this group through resilience-based interventions. Such

interventions with a brief nature may not be adequate to produce long-term improvements

in mental health for children affected by parental HIV. There is a need to develop

resilience-based interventions with sufficient depth and length to produce more robust

improvements in mental health.

The present results also indicate that resilience-based interventions developed for

children with a broad range of age (e.g., 6-17 years) may need to be tailored to match

their developmental and cognitive stages. A universal intervention designed for children at all ages ignores the likelihood that children at different developmental stages may respond differently to the intervention. Resilience-based interventions that ensure the appropriateness of intervention contents to the age of the targeted population may produce greater positive effects (Dray et al., 2017).

Moreover, the present results, in line with previous research (Compas et al., 2017), highlight the potential roles of emotional regulation and coping in facilitating resilience and reducing mental health problems in vulnerable children. However, these findings do not imply that resilience-based interventions should exclusively focus on building internal assets, such as emotional regulation and coping skills. Instead, the research supports the positive effects of emotional regulation and coping on mental health, while it also recognizes that other factors that targeted by the ChildCARE intervention, including positive parenting and social support, may play an important role in reducing the risk for poor mental health among children affected by parental HIV.

5.4. Directions for Future Research

The present results provide some support for the potential benefits of multilevel resilience-based interventions on mental health among children affected by parental HIV. However, research in this line is still limited. More research is needed to test the effectiveness of multilevel resilience-based interventions for this group. For example, instruments that are culturally validated, sensitive to change, and capture multiple mental health domains should be considered in future studies to better determine the mental health effects of multilevel resilience-based interventions (Chmitorz et al., 2018). Also, future studies should consider including assessments of intervention fidelity and

participants' satisfaction with the interventions. Such assessments can provide useful information to explain nonsignificant or even negative intervention effects in a resilience-based intervention study.

Furthermore, the implementation of multilevel interventions is typically more complicated and expensive in terms of both economic and human resources than the implementation of a single-level intervention. Cost-effectiveness analyses are needed to compare the cost and outcomes between the multilevel resilience-based intervention and other types of interventions to make a more convincing rationale for the usage of the multilevel intervention in the future.

There is also a need to identify the optimal length and delivery method for resilience-based interventions among children affected by parental HIV. This research, together with previous reports on the effectiveness of the ChildCARE intervention, suggest that adding booster sessions and integrating the ChildCARE intervention into existing school systems may be encouraging to produce more desirable effects (Harrison et al., 2017; Li et al., 2017b; Harrison et al., 2018). However, more studies are needed to examine the potential benefits of booster sessions and the feasibility of a school-based delivery method for the components within the ChildCARE intervention.

Future research could also benefit from testing other potential moderators and mediators underlying the effects of the ChildCARE intervention on mental health. For example, children's baseline mental health status might be a potential moderator that warranted future research attention. Some researchers have suggested that children who experience higher mental health problems may have more room to show symptom reductions following an intervention (Stice and Shaw, 2004). Also, there is a need to

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examine the mediation roles of other targeted resilience-related factors (e.g., parenting, social support) within the ChildCARE intervention to provide a full picture of how the intervention works, and therefore to facilitate the understanding of the resilience process for children in the context of parental HIV and other HIV-related risk factors.

5.5. Conclusion Remarks

Testing the effectiveness of interventions on mental health for children affected by parental HIV is a necessary effort to advance public health practices and improve mental health for this vulnerable group. The results of this research provide some support for the benefits of the ChildCARE intervention on mental health improvement, whereas the present results also highlight the inherent challenges in producing robust long-term impacts for children who experience a wide range of adversities. Overall, the results from the evaluation of the ChildCARE intervention suggest the promise of multilevel resilience-based interventions in reducing risk and facilitating better outcomes for some of the most vulnerable child groups.

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Sessions of the ChildCARE Intervention

A1. The ChildCARE child intervention session content [a]

Session	Title	Content
1	A colorful life	Introduction and program overview; establish rapport; set child-directed resilience goals
2	Positive swordsmen	Understand links between cognitions, emotions, and behavior; introduce and practice strategies for positive reframing
3	Master of emotions	Learn to identify emotions; understand how emotions affect behavior; Introduce and practice strategies to manage emotions
4	Assertive communications	Examine various communication patterns; learn and practice steps for assertive communication in school and peer settings
5	Connections with love	Review four steps of assertive communication; learn and practice assertive communication within home settings (i.e., caregivers, siblings)
6	My support circle	Identify resources for social support; increase ability to request support from others; learn strategies to support peers and family members
7	Problem-solving	Identify positive coping strategies; review and practice cognitive, emotional, and behavioral skills learned in previous sessions
8	The sunshine comes after the storm	Recognize that challenges are inevitable; understand connections between stress-feelings-thoughts-behaviors; review emotional regulation strategies to use during stressful events
9	My future is not just a dream	Identify strengths in self and peers; increase peer support; promote positive self-esteem and future orientation
10	Let the love shine	Integrate concepts and skills learned in previous nine sessions; recognize importance of individual and peer support to overcome future challenges; review progress on resilience goals

Note. [a] Table was reproduced from Harrison et al (2018)

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A2. The ChildCARE caregiver intervention session content [a]

Session	Title	Content
1	The importance of parents in child development	Establish rapport; program introduction, overview, and schedule; promote parenting self-efficacy; help parents recognize their children's strengths; recognize the importance of parental care in child development
2	Rewards and punishment: parenting practices for externalizing behaviors	Understand the psychological needs underlying children's externalizing behaviors; learn the methods of reward and punishment
3	Listening and communication: parenting practices for internalizing behaviors	Understanding the psychological needs behind children with low self-confidence; learn and practice effective communication skills
4	Positive and reasonable expectations	Learn how to express the appreciation and encouragement to the child; express the future positive expectations for the child
5	Self-care: take care of the body and mind	Encourage parental giving; learn the methods of self-care: social support and self-regulation

Note. [a] Session titles and content translated from the original Mandarin protocol.

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