

A Year-Long Caregiver Training Program Improves Cognition in Preschool Ugandan Children with Human Immunodeficiency Virus

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Objective To evaluate mediational intervention for sensitizing caregivers (MISC). MISC biweekly caregiver training significantly enhanced child development compared with biweekly training on health and nutrition (active control) and to evaluate whether MISC training improved the emotional well-being of the caregivers compared with controls.

Study design Sixty of 120 rural Ugandan preschool child/caregiver dyads with HIV were assigned by randomized clusters to biweekly MISC training, alternating between home and clinic for 1 year. Control dyads received a health and nutrition curriculum. Children were evaluated at baseline, 6 months, and 1 year with the Mullen Early Learning Scales and the Color-Object Association Test for memory. Caldwell Home Observation for Measurement of the Environment and videotaped child/caregiver MISC interactions also were evaluated. Caregivers were evaluated for depression and anxiety with the Hopkins Symptoms Checklist.

Results Between-group repeated-measures ANCOVA comparisons were made with age, sex, CD4 levels, viral load, material socioeconomic status, physical development, and highly active anti-retroviral therapy treatment status as covariates. The children given MISC had significantly greater gains compared with controls on the Mullen Visual Reception scale (visual-spatial memory) and on Color-Object Association Test memory. MISC caregivers significantly improved on Caldwell Home Observation for Measurement of the Environment scale and total frequency of MISC videotaped interactions. MISC caregivers also were less depressed. Mortality was less for children given MISC compared with controls during the training year.

Conclusions MISC was effective in teaching Ugandan caregivers to enhance their children's cognitive development through practical and sustainable techniques applied during daily interactions in the home. (*J Pediatr* 2013;163:1409-16).

Enhanced access to highly active anti-retroviral therapy (HAART) medications for children in the developing world has changed the prognosis for infected children from a uniformly deadly disease early in childhood to one in which survival well into adolescence is not uncommon.¹ African children with HIV are now able to survive longer, but they remain at significant risk developmentally, partly because of psychosocial distress from compromised caregiving and HIV-related orphanhood.² Therefore, it is important to consider strategies for enhancing their cognitive and psychosocial development in the face of HIV disease encephalopathy, psychosocial distress, malnutrition, and seriously compromised caregiving because of parental illness from HIV/AIDS.³

The mediational intervention for sensitizing caregivers (MISC) approach is a training program providing caregivers with strategies for enhancing the development of their children through day-to-day interactions in the home. The MISC approach was developed by Dr Pnina Klein, who has documented the effectiveness of this approach with impoverished children in Africa and globally.^{4,5} Unlike models based on simple direct learning through stimulating the senses with an enriched environment,^{4,6-10} MISC is a mediational approach based on Feuerstein's theory of cognitive modifiability.^{11,12} We selected MISC for our caregiver training intervention because it is culturally adaptable in low resource settings and significantly enhanced cognitive, language, behavioral, and academic outcomes in impoverished children in Addis Ababa, Ethiopia.^{4,5,10}

CAI	Childhealth Advocacy International	HSCL-25	Hopkins Symptoms Checklist 25-item
CBCL	Child Behavior Checklist	MELS	Mullen Early Learning Scales
COAT	Color-Object Association Test	MISC	Mediational intervention for sensitizing caregivers
HAART	Highly active anti-retroviral therapy	MSU	Michigan State University
HOME	Home observation for measurement of the environment	OMI	Observing mediational interactions
		RM-ANCOVA	Repeated-measure ANCOVA
		UCOBAC	Uganda Community Based Organization for Child Welfare

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The fundamental premise of this approach is that mediated learning best occurs interactively, when the caregiver interprets the environment for the child. To do so, the caregiver must be sensitive to the child's cognitive and emotional needs, interests, and capacities.

MISC training teaches the caregiver practical strategies for: (1) focusing (gaining the child's attention and directing him/her to the learning experience in an engaging manner); (2) exciting (communicating emotional excitement, appreciation, and affection with the learning experience); (3) expanding (making the child aware of how that learning experience transcends the present situation and can include past and future needs and issues); (4) encouraging (emotional support of the child to foster a sense of security and competence); and (5) regulating (helping direct and shape the child's behavior in constructive ways with a goal towards self-regulation).^{4,5,10,13}

The principal study goal was to implement a MISC caregiver training intervention with the principal caregivers of preschool-age children with HIV in an impoverished rural district area of Uganda. Using a prospective treatment and active control group (treatment as usual) cohort design, we hypothesized that a year-long biweekly MISC caregiver training program would significantly enhance the development of these children (motor, cognitive, psychosocial) compared with controls. This is because African children with HIV show poorer scores in memory, attention, language skills, visual processing, reasoning, and motor skills.¹⁴⁻¹⁶ The second study aim was to evaluate the impact of the MISC intervention on the emotional well-being of the caregivers themselves. Such benefits were qualitatively observed in the Ethiopia MISC study.⁴

Methods

Institutional review board approval for this study was obtained by Michigan State University (MSU) and Makerere University. Research permission was issued by the Ugandan National Council for Science and Technology. Children in Kayunga town and surrounding districts, Uganda (80 km northeast of Kampala) were referred to our study by Child-health Advocacy International (CAI) of Uganda. CAI was a non-government organization providing monthly home-based medical care to children with HIV in the Kayunga district.¹⁷ We selected this study site because of the opportunity to collaborate with CAI. After consent, 120 caregiver/child dyads were randomly assigned to either biweekly MISC training intervention or a health and nutrition educational curriculum (active control group).

The 60 children given MISC ranged from 16 months to 5 years of age at enrollment ($M = 3.8$ years, $SD = 1.2$; 58% male) as did the control children ($M = 3.5$ years, $SD = 1.4$; 51.7% male). At the time of the study, the Uganda Ministry of Health followed the 2006 World Health Organization guidelines ($CD4\% < 20$, $< 750 \text{ mm}^3$ for children 12 to 36 months) for determining when to initiate HAART in children with HIV. The Walter Reed Project in Kayunga district managed the clinical care of children with HIV in Kayunga

through US President's Emergency Plan for AIDS Relief support. One-half of the children given MISC and 57.8% of the control children were on HAART treatment during the intervention year (Trimune: d4T/3TC/nevirapine). CD4 and CD8 activation measures in **Table I** are presented as percentages of CD38, HLA antigen D related. Biweekly training sessions with both groups of caregivers were 1 hour long and alternated between home (so trainer could observe and direct caregiver-child interactions) and study office (where videotapes of interactions were used).

Children were included in the study if they had HIV at age 16 months to 5 years, born to a mother with confirmed HIV. Children were excluded from the study if they had a medical history of serious birth complications, severe malnutrition, bacterial meningitis, encephalitis, cerebral malaria, or other known brain injury or disorder requiring hospitalization, which could overshadow the developmental benefits of MISC. Children enrolled in school during the training year were excluded because caregivers with children still at home would benefit most from caregiver MISC training.

Prior to and during the study, our MISC consultants (P.K., C.S., D.G.) did several week-long workshops with our Ugandan field team on how to train caregivers in the MISC program. The program director for the Uganda Community Based Organization for Child Welfare (UCOBAC; <http://ucobac.org/cms/>) trained a separate field team for training the control-group caregivers in a health/nutrition educational program. UCOBAC has implemented this curriculum in impoverished households in 17 other rural Ugandan districts.

The MISC consultants also taught the field team how to videotape 5-minute segments of the caregiver bathing the child, feeding the child, and working with the child. These 15-minute recordings were made for the MISC intervention dyads in the home at the start of the year-long training and thereafter every 3 months. The tapes were played back to the caregivers by the field trainers and used as part of the MISC training during each biweekly session. The video recordings at baseline, 6 months, and 1 year were scored by an independent observer at a separate study site, using the observing mediational interactions (OMI) rubric developed by Dr Klein.^{4,5,10,13} OMI scoring of 15 minute video tapes were scored for the total number of focusing, exciting, expanding, encouraging, and regulating MISC-type caregiver-child interactions. This measure helped document fidelity of training and served as one of our training outcomes. Similar recordings were also scored for the control group, but not used in their biweekly training.

At baseline, 6 months, and 1 year, a home visitor independently administered the toddler version of the Caldwell Home Observation for Measurement of the Environment (HOME) scale.¹⁸ We wanted a measure of caregiving quality that was independent of the OMI, and we have previously adapted the HOME in the Ugandan context and it has proven sensitive to cognitive outcomes in children.¹⁹ We also included a socioeconomic status measure based on dwelling (eg, roofing and flooring composition, number in household, water source, toilet facilities, and cooking facilities) and

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