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A quasi-experiment examining the impact of educational cartoons on Tanzanian children

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ABSTRACT

Educational media can positively impact young children; however, few studies have been conducted in developing countries. Researchers investigated the impact of an animated educational series, where participants were randomized to see *Akili and Me* versus other popular programs. In interviews with children, researchers assessed measures before and after four weeks of exposure. From Morogoro, Tanzania, 568 children (mean age - 4.8 years) participated. Controlling for the child's sex, age, and baseline skills in the assessed follow up outcome, exposure to *Akili and Me* significantly improved drawing skills, shape knowledge, number recognition, counting, and English skills. Young and vulnerable children can benefit from a locally-produced educational program. Media interventions should be encouraged as they effectively and efficiently alter school readiness.

1. Introduction

Pre-primary and primary school children need foundational literacy, numeracy, and cognitive skills in order to achieve advanced educational and economic opportunities (Ball, Paris, & Govinda, 2014). Furthermore, education is significantly associated with many health outcomes, especially for the following generation, with increases in maternal education leading to significantly reduced child mortality and improved health outcomes (Gakidou, Cowling, Lozano, & Murray, 2010). While great progress has occurred in the last decade in terms of educational access and equity, many Tanzanians lack a strong base necessary for later success. Though Tanzania has achieved the Millennium Development goal of universal primary education (TMEVT, 2014), the quality of education remains extremely low with half of Tanzanian children aged 10–16 years unable to pass basic literacy and numeracy tests set to the level of an 8 year old (Uwezo, 2013).

Several reasons explain why Tanzanian children fail to thrive in primary and secondary school. To begin, many lack an educational foundation to build upon. Only 42.4% of Tanzanian children are enrolled in pre-primary education (ACEI, 2016). While in very recent years boys and girls have had the same level of access to pre-primary school, there are great attendance disparities in terms of geography (urban vs. rural) and wealth. Urban children are more likely than rural children to attend pre-primary schools; 84% of pre-primary school age children (5–6 years) who were out of school lived in rural areas. Of those children attending school, 62% came from “rich” and “very rich” households, compared to 23% of those from “poor” and “very poor” households (Uwezo, 2016). Even children who do attend pre-primary school face challenges gaining a solid base. Cosmas (2010) described pre-primary education in Tanzania as inadequate, having an absence of instructional materials, lacking chairs, tables, or desks, having very high enrollment, and a having a scarcity of trained pre-primary education teachers.

The path of child development is similar across populations, however, in countries and communities where resources are limited, age-related milestones exist but can be slightly delayed (WHO, 2007). Despite poverty, malnutrition and poor infrastructure, the typical Tanzanian preschool child remains eager to learn (TMEVT, 2014). Essential to learning about the world around them, play and leisure activities are critical to the 3 to 6 year old. During this early childhood period, receptive and expressive language skills advance, with the young child gaining an ever-increasing vocabulary and having the ability to engage in conversations. By age 5 years, children become aware of literacy, finding their worlds are filled with letters; some children can recognize familiar words in print and most are enthusiastic about acquiring reading skills (Zhao, Zhao, Weng, & Li, 2014). A critical and learned skill developing around this age is the ability to recognize and use language to describe emotions; it is important that young children be able to use appropriate words to convey when they are feeling happiness, sadness, anger, and fear (Denham & Couchoud, 1990). Also during this period, preschool children are learning essential math skills (i.e., counting, addition and subtraction, estimation, patterns, classification, and measurement), which will form a foundation of both concrete and abstract thinking (Fisher, Hirsh-Pasek, Golinkoff, Singer, & Berk, 2011).

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Developmentally, this age is when children come to understand dimensional structures; symbols, such as letters or numbers, represent other things and can be connected (Case, 1992; Fischer, 1980). A child who is more adept early literacy tasks, emotional expression, and basic numeracy will 'ready to learn' in a formal school environment than one with fewer of these skills (National Education Goals Panel, 1998).

While not a replacement for a solid and enriching pre-school experience, educational media can serve as a stand-in by stimulating and supplementing learning. Around the world, well-produced television programming can engage hard-to-reach audiences by offering a source of informal education and enrichment (Mares & Pan, 2013). The theorist Albert Bandura was one of the first to explore media effects, especially among young children (Bandura, 2001; Bandura & Walters, 1963). Bandura noted that message components could be manipulated to impact attention, motivational processes, as well as self-efficacy. Attractive and relevant models, which can be examined through constructs like perceived similarity, increase the likelihood of successful observational learning (Bandura, 2004). Described in Fisch's Capacity Model (Fisch, 2000), successful educational programs narrow the distance between the educational content and the narrative, so that facts and lessons are tightly woven into the storyline. Additional factors that can increase children's learning include bold and bright images and simple, melodic music (Yazejian & Peisner-Feinberg, 2009). Finally, familiarity with content, either through repetition, recognizable artifacts, or known subjects, results in children's greater learning from media (Crawley, Anderson, Wilder, Williams, & Santomero, 1999; Fisch, 2000).

The most well-studied children's television show has been *Sesame Street* (Cole & Lee, 2016). Longitudinal research conducted in the United States shows that children's early educational viewing can lead to positive trajectories, lasting well into secondary school (Anderson, Huston, Schmitt, & Linebarger, 2001; Fisch, 2014). Preschool children exposed to the various international versions of *Sesame Street* have made significant gains in knowledge about letters, numbers, shapes, science, environment, one's culture, and health and safety-related practices (Borzekowski & Henry, 2011; Borzekowski & Macha, 2010; Cole et al., 2003; Mares & Pan, 2013). In a study of 223 Tanzanian preschool children, significant gains in literacy, numeracy, social development, and emotional development were associated children's receptivity of *Kilimani Sesame*, as assessed through the accurate naming of the program's characters (Borzekowski & Macha, 2010).

Besides the literature on *Sesame Street's* international productions, no published research, to date, exists on the impact of children's media created in low and middle income countries (LMICs). The fact is, very little educational media is produced, and in turn evaluated, in LMICs. In such countries, most children's programming is comprised of entertainment and is imported from developed, northern-hemisphere countries (Bryant, 2007; Hendriyani, Hollander, d'Haenens, & Beentjes, 2011; Osei-Hwere, 2011). A study conducted in six LMICs found that young children were most familiar with the globally-distributed characters of Tom & Jerry, Mickey Mouse, Ben 10, and SpongeBob Squarepants (Borzekowski & Pires, in press). The research presented in this paper is unique in that it examines the impact of a locally-made educational program produced in Dar es Salaam, Tanzania. Using a carefully designed study, we expected that young, peri-urban children exposed to several episodes of the educational cartoon *Akili and Me* compared to a similar cohort watching episodes of other contemporary and popular TV programs would show greater gains in various educational outcomes.

2. Method

2.1. Setting

This study occurred in early 2016 and participants came from Morogoro. This location is in the eastern part of Tanzania, around 200 km west of Dar es Salaam, at the base of the Uluguru Mountains. Approximately 300,000 people live in Morogoro and the prominent industry is agriculture (National Bureau of Statistics, 2012). In this region, 20.7% and 15.9% of women and men, aged 15 to 49 years, respectively, have a secondary education (MoHCDGEC et al., 2016).

2.2. Procedures and sample

The intervention began at school year's start, and involved children aged 3 to 6 years who had not yet attended any formal pre-primary school. At initial school year in-person meetings, parents were told about the study and informed that the purpose was to examine how controlled viewing of videos might affect children. Parents were provided with an overall list of videos that children might see during the study, without specific attention to *Akili and Me*. While viewing was incorporated into the regular school day, the protocol required active parental consent and active participant assent for partaking in the interviews and assessments. After the consent procedure, parents were interviewed, so demographic information could be obtained. Researchers assessed participating children at baseline and immediately following the intervention, which lasted four weeks. Interviews were in the local dialect of Kiswahili.

The baseline sample included 595 preschool children drawn from 9 randomly selected schools in peri-urban areas of Morogoro. This post intervention sample consisted of 568 children and this group served as our primary analysis sample. These children were on average 4.8 years (SD = 1.1) and 51.3% were female. Slightly more than half (57.2%) of the parents reported that the child lived in a household with an adult who had higher than a secondary education. According to parents, the children lived in households where 69.4% had a radio, 54.9% a television, 25.4% a refrigerator, and 74.6% piped water. Most (89.6%) households had a mobile phone; 27% of these phones were "smart phones." No significant differences were observed between the treatment and control children in terms of demographics or household resources.

Protocols were developed and reviewed by U.S. and East African child development experts, then pilot-tested with a sample of preschool children in Dar es Salaam. Instruments are available upon request. A team of 24 Tanzanian researchers were recruited and underwent extensive training, an initial two week course and then continuous in-person supervision so that protocols were delivered in an ethical, reliable, and valid manner. As part of this training, the researchers heard lectures on child development and research practices with young children. They practiced conducting research with young children and were very familiar with the different assessment tools. Additionally, approval for conducting research was obtained from the Tanzanian Commission for Science and Technology (COSTECH) and the University of Maryland's Institutional Review Board.

One-on-one interviews were done in Kiswahili before and after children were exposed to the intervention. It should be noted that the researchers were blind to the study's purpose and were not told if the child was in the treatment or control group. The interviews with the children took, on average, 40–45 min. Many questions allowed children to point to their answers on picture cards. Other questions were open-ended or involved scoring a response. For example, the researchers had a code scheme for how well the child drew his or her triangle. Researchers would give a score of 0, 1, 2, or 3 for the number of closed corners without gaps and a 0 (no) or 1 (yes) for whether the child's triangle resembled a triangle with diagonal, relatively straight lines.

Researchers also interviewed parents also in Kiswahili, for around 35 min, focusing questions on the child's demographics, household resources, and media use. These questions were all close-ended with structured responses.

After the baseline survey, researchers randomized children at each school setting for the intervention. Children were assigned to watch 30 min of *Akili and Me* (the treatment group) or popular children's