AN ABSTRACT OF THE THESIS OF

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Abstract approved:

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Joseph Catania

HIV testing among high risk adolescents in Dar es Salaam, Tanzania is challenging due to poor access to test sites and AIDS-related social stigma. We adapted the OraQuick HIV Test, a self-implemented test (SIT), for low literacy youth with no internet access. To compensate for poor literacy, a picture instruction book was developed to illustrate each SIT procedure without using written language. Participants (15-18 years; N = 25) performed all SIT procedures (e.g., use of sample collection swab) under simulated conditions. Results showed that, overall, 4 of 5 testing procedures were correctly understood and performed by a majority of participants (60-80% correct/procedure). Males were slightly more accurate than females. Based on semi-structured interviews, suggestions for improving the picture instructions were identified. The results suggest that the adapted instructional method, replacing written and technological-based SIT instructions, has merit and warrants a second stage of development with the goal of further increasing SIT competency rates. Visual instructions for SIT have wide application in countries with high levels of illiteracy, low Internet coverage, and poor access to HIV test sites.

Key Words: HIV, Self-Implemented Testing, Adolescents, Tanzania

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Adaptation of a Self-Implemented HIV Test Among Adolescent Youth in Tanzania

by
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Introduction

The current strategy for eliminating HIV follows the test-and-treat model of HIV prevention (Kretzschmar, Schim van der Loeff, Birrell, De Angelis, Coutinho, 2013). This involves testing at risk individuals, identifying HIV positive individuals, and initiating antiretroviral treatment. After beginning treatment, viral load will be greatly reduced, which, in turn, reduces HIV transmission rates (Kretzschmar, 2013). The crucial step in this prevention strategy is HIV testing. However, there are many underserved geographic areas with low access to HIV testing.

Testing among high risk youth is universally low in both developed and developing nations. In Tanzania, there is a 5.6% HIV prevalence rate among 15-49 year olds (“Millennium Development,” 2014); this prevalence rate is higher in urban areas of the country. In Dar es Salaam, the largest urban area of Tanzania with an estimated population of over four million people, the HIV prevalence rate is over 6.9% for individuals 15-49 years old (Tanzania Commission for AIDS et al., 2013). Of individuals 15-49 years of age who report having more than one sexual partner over a 12 month period (2012-2013), only 27% report using a condom for their last sexual encounter (UNAIDS, 2014), and few Tanzanians get HIV tested; only 28.4% of individuals 15-49 years of age had been HIV tested in the past 12 months (2012-2013) and were aware of their results (UNAIDS, 2014). The prevalence of repeat-testing and partner testing among at-risk persons are unknown, and are necessary components of the test and treat model. Increasing testing rates, repeat testing, and partner testing are important goals in translating test and treat approaches to Tanzania.
Obtaining HIV testing in Dar es Salaam is difficult due to a lack of testing centers and the presence of multiple barriers to accessing existing centers. Prior work suggests that, among other factors, Tanzanian youth encounter barriers related to the social stigma associated with AIDS and a poor understanding of the importance of receiving early treatment (Schwarcz, Richards, Frank, Wenzel, Chin Hsu, Chin, Murphy & Dilley, 2011; Durojaye, 2011; Amuri, Mitchell, Cockroft & Andersson, 2011). In addition, geographic barriers limit access (transportation problems). Although, such barriers are partially alleviated by mobile testing programs (Matovu, 2011), such programs are labor intensive and may not reach orphaned, homeless, or extremely low income youth.

Self-implemented testing (SIT), if appropriately translated, may offer a viable alternative for increasing the reach of HIV testing services to homeless and low income youth. SIT kits in theory could be disseminated from a wide range of locations, and potentially offer greater privacy for the individual (e.g., See Pai et al., 2013; Mavedzenge, et al., 2013). Among self-implemented HIV tests the OraQuick test by OraSure is the preferred kit by consumers since the oral specimen collection technique is highly desired over finger stick methods (Pai et al., 2013). The kits are relatively simple to use, but have not been adapted for non-English/Spanish speaking cultures nor for those who have limited education and or are illiterate. Moreover, instructions for the current kits utilize not only print formats, but also internet media that are not accessible by low income youth in Tanzania. Self-testing is an important area of new study in the HIV testing field. It could increase HIV testing by allowing people to test themselves in their own homes, better avoiding stigma and possible discrimination (Pai et al., 2013).

OraQuick SIT kits provide a way for people to test themselves for HIV in the
privacy of their own home. The test requires that the person to swab their upper and lower gums once with a specimen stick, place that specimen stick into a testing tube filled with testing solution, to wait for twenty minutes and then interpret the test results that appear on the specimen stick. This test has been found to have a 99.3% sensitivity and a 99.8% specificity (OraSure, 2013). Hurt and Powers (2014) observe, however, that sensitivity for OraQuick is lower in the hands of adult literate consumers than when administered by a trained provider (92.9% vs. 99.3%), providing evidence of the challenges faced in translating SITs even to a literate public (Catania et al., 2014). It is important that all steps of the SIT are performed correctly. An epidemiologist from Johns Hopkins University stated that “You need to make sure that the test is foolproof because you need to assume that the level of skill of someone taking the test is low,” (Arnold, 2012).

Currently, self-testing has not been implemented in Tanzania. It could be a means of increasing testing rates, especially among the youth who are most at risk for contracting HIV. Improving instruction materials is an important step in this translation process. As noted previously, the written and video instructions are in English and Spanish, but the most widely spoken language in Tanzania is Swahili. Translation into Swahili has its own challenges, but even a well-adapted translation may be insufficient for less educated and illiterate youth. In Tanzania, only 71.8% of Tanzanians from the ages of 15-24 have basic literacy skills (“United Nations,” 2013). This percentage is lower for women than for men, 66.8% and 76.4% respectively (“United Nations” 2013). Thus, written instructions are not a universal option for a large percentage of the population. Moreover, video instructions are not a feasible alternative since very few
This study developed a strategy for training Tanzanian youth on how to do self-implemented testing. A qualitative simulation study was conducted with a group of youth in the city of Dar es Salaam, Tanzania. These youth were members of the community based organization, Faru Arts and Sports Development Organization (FASDO). This study population consisted of illiterate to semi-literate youth ages 15 to 18. Thus, a picture flip book was created as instruction for the Oraquick self-test to replace written instructions and internet based instructions inaccessible to this population. The flip book contains pictures of how to correctly perform every step of the test and uses no words. The purpose of this study was to examine whether or not the picture flip book adaptation to the OraQuick test was a way that self-testing could be implemented among youth in Tanzania.

**Methods**

**Participants & Recruitment Procedures**

Recruitment was conducted on site at the Faru Arts and Sports Development Organization (FASDO) which serves an impoverished area of Dar es Salaam, Tanzania. Clients attend FASDO on a drop-in basis over the course of the day, where they participate in sports and arts activities and receive some minor health care information and occasional food. FASDO staff gathered adolescents of the appropriate age group on a patio outside the main FASDO building for recruitment. The FASDO director presented a scripted public announcement. This announcement was read to the adolescents at FASDO every morning over the course of one week. Following the announcement, the
adolescents were given instructions explaining where they needed to go to receive more information about the study and, if interested, participate in the consent process.

A total of 30 adolescents volunteered to take part in the consent/screening process. During the consent process, interviewers screened potential participants based on whether or not they could perform study procedures and whether or not the potential participant understood that they were not taking a real HIV test. Of these 30 volunteers, 5 did not participate following screening; three were ineligible because they did not understand that this was not a real HIV test, and two declined to participate upon learning about the study. Participant eligibility was also determined during the consent/screening process. Inclusion criteria were that the participant must be a male or female between 15 and 18 years of age and they must be attending FASDO and understand the purpose of the study. Of the 25 eligible participants, 14 were male and 11 female. Based on reports from the FASDO staff, adolescent members of the organization were described as being orphaned, socially and economically disadvantaged, and/or having a high rate of homelessness. The staff informed investigators that many but not all adolescents at the organization were illiterate. Thus, the sample is best described as semi-literate to illiterate. To avoid embarrassing participants, no literacy tests were administered. This study was approved by the Institutional Review Board at Oregon State University and the FASDO director and staff reviewed all study documents and procedures, and accepted the approval of Oregon State University’s IRB to conduct this research at their facility.

**Simulation Procedures & Data Collection**

**Simulation Design: Overview.** Following a verbal consent process, participants took part in a series of study procedures including interviews and simulation tests. The
first procedure was an interview in which participants were asked questions regarding their general understanding of HIV/AIDS and HIV testing. Second, the participants performed a simulation of the modified *Oraquick In Home HIV Test* using the testing kit and a picture instruction book as a guide for taking the test. Testing chemicals were removed from the testing kit, thus, no HIV test results could be obtained. Following the simulation test, there was another interview during which participants were walked through the picture flip book, instruction by instruction, and asked what their interpretation of each picture instruction was. All participants were debriefed following the last interview.

**Data Collection: Interviewers.** For this study there were two interviewers, one male and one female. They were both 20 year old university students, near to the age of the participants, and were from Dar es Salaam, Tanzania. Both interviewers came from an area similar to the location of FASDO. Thus, they spoke the same dialect of Swahili as the participants. Prior to the study, the interviewers received training sessions for three days. These training sessions involved practice interviews, audio recorded pilot testing interviews, and reviews of these practice interviews by experienced trainers. The interviewers were also provided with a field guide with interview instructions during the actual study.

**Data Collection: Interviews.** Interviews took place in two interview rooms. These rooms were designed for music recording, so they were sound proof. Male participants conducted study procedures in a room with the male interviewer. Female participants conducted study procedures in a room with the female interviewer. Both the pre and post-simulation interviews were based on a semi-structured questionnaire format.
All interviews were audio recorded and the interviewers took behavioral notes when necessary. Following the post simulation interview there was a debriefing conducted by the interviewers. During the debriefing, interviewers explained once more that the participant did not take a real HIV test. The interviewer then offered to provide the participant with information on where to get tested for HIV. If the participant wanted information, they were directed to Muhimbili National Hospital to receive HIV information and testing.

Participants were given materials to conduct the OraSure HIV test including the self-test kit and a picture instruction book. A female, native Tanzanian model was used for each of the picture instructions. A picture, or series of pictures, illustrated each step of taking HIV self-test. We consulted with native Tanzanians in Dar es Salaam to ensure that any symbols used in the instructions would be familiar to the adolescents at FASDO. Pilot tests were conducted prior to the study in Tanzania that led to modifications to clarify some of the picture instructions. Interviewers instructed participants to look through the picture instruction book. Behavioral notes on the participant’s review of the picture instruction book were taken by the interviewers. The participant was then instructed to take the simulation test using the picture instruction book as a guide for each procedure in the self-test. As they took the test, the interviewers took notes on a behavior checklist which indicated if the participant used the picture instruction book and whether or not they correctly executed each step of the HIV self-test. Following each day of interviewing, interviewers and a field supervisor met to resolve problems that arose during the day, and make minor modifications to procedures or questions.

Measures
Measures used in analysis for this report are described here, the full interview instrument is available from the first author. All study interviews and instructions were first developed in English and, then, translated into Swahili. To do this, a forward and backward translation process was used. Two translators participated in the process. Both were native Tanzanians who were bilingual in both English and Swahili, specifically the dialect spoken in Dar es Salaam. One translator conducted the forward translation from English to Swahili and the second translator translated the document in Swahili back into English. Both of the translators and the research team reconciled any translation differences to produce a revised Swahili document.

The pre-simulation interview was comprised of general HIV questions. Participants were asked questions about what their understanding of HIV/AIDS was, how they thought HIV is transmitted and where to get tested for HIV. Investigators also asked participants what they believed were barriers to HIV testing and whether or not they had ever been tested for HIV.

A behavioral checklist was created to assess the participant’s ability to conduct the simulated HIV self-test. All self-implemented testing procedures followed those described by the manufacturer with one exception (described below). Interviewers noted how the participant used the picture instruction book as well as whether or not they correctly executed each critical step of the test. These critical steps included (a) understanding the instructions on not eating, drinking or brushing teeth 30 minutes before taking the test, (b) swiping the specimen stick across each gum, (c) placing the specimen stick into the testing tube, (d) setting the timer and waiting for twenty minutes, and (e) correctly interpreting test results. To assess whether or not the participant could correctly
read the test results, interviewers showed them a picture with both test results and asked which result indicated that they should go to the doctor (positive test results meant that they should go to a doctor). Interviewers also took behavioral notes on whether or not the participant was having difficulty understanding or using parts of the picture instruction book or the picture instruction book as a whole.

The post-simulation interview was designed to further assess the participant’s understanding of the picture instruction book. The participant was walked through the picture instruction book and was asked for their interpretation of what that instruction meant. If they made an error, the interviewer indicated what the instruction was supposed to be telling them to do. The interviewer then asked the participant how the picture instruction could be improved, if they disliked anything, if other youth would be able to understand the instruction, and if they had any questions about the picture(s).

**Data Management and Analysis**

All interviews were audio recorded and these were then transcribed verbatim in Swahili, and then translated into a written English document. For the translation and transcription work, the translator listened to each audio recording twice to produce the first draft transcript. The first translated transcript was in English. Then the English transcript was then back-translated into Swahili. The translator then listened to the audio recording an additional time, and if there were any discrepancies, the translator re-viewed that portion of the audio recording to resolve discrepancies. Thus, there was quality assurance for both the transcription and translation of the audio recorded interviews.

Our analysis of open-ended questions was based on a content analytic approach (Hseih & Shanon, 2005). We used descriptive coding (Saldana, 2013) to identify
problems and solutions with the picture guide instructions. We scored correct-incorrect execution or understanding of critical HIV self-testing steps (described under measures). Summary descriptive statistics were computed as needed. We conducted reliability checks on all coded material. Two coders developed a code book to guide this process through an iterative process of coding, revising, and then recoding as needed. Initially, the two coders each coded three transcripts and then discussed and resolved any differences in coding. One coder then coded the remaining transcripts. All of the coded transcripts were then sent to the second coder. The second coder was then randomly assigned three transcripts to do a reliability check on. If there were differences, they were discussed and resolved, and codes modified across all transcripts. The behavior checklists used by the interviewers during the participants’ performance of the simulation test were analyzed to interpret how well the picture instruction book was understood. Proportions for the number of participants who correctly performed each of the five most critical steps of the simulation test were calculated. Confidence intervals (95%) were constructed for these point estimates for each of the five steps. Confidence intervals that do not include zero are then interpreted as being nontrivial point estimates. A Fisher’s Exact Test Chi-Square test was conducted to examine potential testing performance differences between males and females and to determine if there was an association between being previously tested for HIV and performance of the simulation test.

**Results**

**Overview**

We conducted analyses to address the following question, were study participants able to use the PIB to correctly complete the SIT simulation? That is, were they able to
use the picture instructions to perform the test procedures with high fidelity? To analyze if the PIB was able to help the participants take the SIT simulation with good fidelity, we examined five testing procedures: (a) not eating, drinking or using oral products 30 minutes prior to taking the test, (b) correctly using the specimen swab (swiping motion across the upper and lower gums), (c) correctly placing the used specimen stick into the testing tube, (d) correctly using the timer and timing of the self-test, and (e) correctly interpreting test results.

Participants

Of the 25 participants, (14 males and 11 females), 21 participants fully performed the SIT simulation. Four male participants did not perform the last step of the SIT simulation, but demonstrated a clear understanding of the picture instructions leading up to the final procedure (reading the test results). Previously, these participants had indicated correctly what a positive and negative test result was and that you should go to a doctor if the result was positive. However, based on interviewer observations, these participants began to exhibit some resistance to questions later in the interview regarding their interpretation of the picture instructions (those that seemed obvious or redundant became noxious to these participants). They began answering final interview questions with “I don’t know” responses when clearly they had opinions to express on all earlier questions. Based on the preponderance of the evidence, these “I don’t know” responses were treated as missing data, that is, as if they had said, “I don’t want to answer that”.

Simulation Test
Pre-test Instructions. Eight percent (2/25) of participants were able to correctly understand the instructions to not eat, drink or brush your teeth 30 minutes before taking the test (see Figure 1). Both participants were male. Participants indicated that the primary area of confusion with these instructions was with the clock used in the illustration, and, consequently, participants were unable to correctly identify the amount of time needed between eating, drinking and brushing teeth and taking the self-test. Participants suggested improving this picture, by replacing the pictured clock (standard clock face) with a picture of a digital clock face. In addition, it was suggested that using a circle with an “X” through the picture instead of the international circle (◯) with a line might help in more clearly illustrating not to eat, drink or brush your teeth.

Specimen Swab. Approximately 64% (16/25) of participants, 71% (10/14) of males and 55% (6/11) of females, were able to correctly use the specimen swab to swipe their gums (Figure 1). In addition, all participants were able to perform the miscellaneous behaviors leading up to this procedure (e.g., open the test kit, take out the materials, and open the specimen stick packaging). A common error was to not swipe the gums, but to simply touch the specimen stick to the gums at various points which would not be sufficient to obtain a specimen. Participants suggested that using a larger, more curved arrow to indicate that a swiping motion is needed would be helpful (See Picture Set C, Appendix A).

Inserting Specimen Stick. Approximately 84% (21/25) of participants, 86% (12/25) of males and 82% (9/25) of females, correctly placed the used testing stick into the tube with the testing solution (Figure 1). Among the minority of participants who incorrectly performed this procedure, the most common error was not understanding that
the stick needed to go into the tube. They held the specimen stick above the tube, which would have been a concrete interpretation of the pictured instructions (See Appendix A, Picture Set D). A suggested solution was to create a sequence of actions, illustrating that you should place the specimen stick into the tube. Participants also suggested using a larger photo to clarify the direction you should place the specimen stick into the tube.

**Timing The Test.** Approximately 68% (17/25) of participants, 71% (10/14) of males and 64% (7/11) of females, correctly timed the test (Figure 1) using the kitchen timer provided. A kitchen timer was used because (a) we had anticipated that participants might be more familiar with this type of clock face that often appears in public places and (b) the instructions on how to use the timer seemed straightforward. However, it became clear that this was not the case. To adapt to this circumstance, interviewers instructed participants on how to use the timer. Participants were able to use the instruction guide, however, to correctly set the kitchen timer to 20 minutes, the time required for the test results to appear on the specimen stick. Apart from being unfamiliar with the kitchen timer, participants also noted that the instructions would be clearer if the 20 minute mark was highlighted by a color in the picture.

**Interpreting Test Results.** As noted previously, participants did not actually perform an HIV test. To examine their ability to correctly read the results and take the correct action, we provided participants with a picture depicting the different results that might appear on the specimen stick and the action to take depending on what the result was (e.g., go to a doctor if the test was positive). Correct identification of a positive and negative test result was not relevant, what was relevant was interpreting what action to take based on the test result pattern in the testing window of the specimen stick.
Approximately 71% (15/21) of participants, 70% (7/10) of males and 73% (8/11) of females, indicated that the HIV positive test result (the one with two lines in the testing window) means that you should go to the doctor (Figure 1). Four male participants did not complete this portion of the simulation (see Results, Participants). Among participants completing this portion of the simulation, some had concerns with the instruction picture depicting the physician. Participants thought that a red X through the doctor for the HIV negative result would make the picture clearer than a circle with a single line. A few participants suggested including positive (+) and negative (-) signs, respectively, for a positive and negative results.

Miscellaneous Participant Observations

In addition to the suggestions noted previously, participants also indicated that the pictures should be larger (original pictures printed on 8 x11 inch pages) in order to make it easier to see what the picture was instructing them to do. This may suggest that some youth had vision problems. The addition of a few key words for semi-literate youth was also suggested as a method of augmenting the picture instructions. Participants also noted various barriers to HIV testing. This range of barriers to HIV testing included fear, worry, social stigma, embarrassment, sadness and social pressure.

Confidence Interval (95%) and Chi-Square Tests

We calculated 95% confidence intervals and Fisher’s Exact Chi-Square tests using an online site, graphpad.com. A 95% Confidence Interval was constructed for the proportion of participants correctly completing each of the five testing procedures. If the 95% confidence interval includes zero, this suggests that the point estimate may not be different from zero. The pre-testing procedure was the only SIT simulation procedure that
included zero within the confidence interval, and, therefore, we would conclude that the pre-test procedure instructions were not helpful to participants. The other four testing procedures had confidence intervals that did not contain zero (Table 1) suggesting that the relevant instructions were helpful to a substantial number of participants.

A Chi-Square test was conducted to analyze differences on SIT simulation performance based on the gender of the participants. Male and female proportions were compared for each of the five testing procedures. No significant gender differences were found (all p-values > 0.10).

We also conducted an exploratory analysis (Fisher’s Exact Test) of the SIT simulation results to examine if a history of testing was associated with correct performance of the test. Participants who had been tested performed significantly better on the procedure of placing the used specimen stick into the testing tube (p-value = 0.05), but there were no differences for the other four SIT procedures (p-values > 0.10).

**Discussion**

**Overview of Results**

The results show that pictorial instructions have significant potential for facilitating self-implemented testing (SIT) among persons with poor reading skills and limited technology access, such as the youth we studied in Tanzania. The majority of the participants were able to correctly perform the steps of the simulation SIT, showing that the picture instructions were understood fairly well. Our results also indicate that the current pictorial instruction materials require further modifications (see below).

**Recent Translation Research on SITs**
A recent study of SIT was conducted in Kenya, Malawi and South Africa (Peck et al, 2014). Participants in this study took unsupervised simulations of various SIT prototypes. For instructions they were given pages with graphic and written instructions in English and the local language. Of the 150 participants, 25% were able to correctly perform each step of the SIT prototype and 47.3% of the participants made multiple errors throughout the simulation testing process. Investigators determined that the instructions needed further adaptation for the low-literacy participants. The instructions also needed to be more descriptive of all actions throughout the test, such as how to handle sample collections properly (Peck et al, 2014).

Our study, by comparison, had a much higher success rates for participants taking the simulation SIT. In the other study, only a minority of participants were able to correctly perform each step of the simulation test, while in our study, the majority of participants were successful in correctly executing each step of the simulation SIT. This suggests that a picture instruction book may be a more successful way of instructing people in Sub-Saharan Africa on how to use HIV SIT.

Another study involving SIT HIV testing was done with a literate study population, which also demonstrated the difficulty in translating this type of HIV testing to the public. The study showed that the sensitivity for the OraQuick is lower in the hands of consumers than when the test is administered by trained providers of the test (92.9% vs. 99.3%). Thus, SIT instructions have limitations even with literate populations (Hurt & Powers, 2014).
Pictorial Instructions: Recommendations

Our results pointed to a number of potential modifications to the current PIB. There was one picture instruction, “Do not eat, drink, or brush your teeth thirty minutes before taking the test,” that was not understood by most of the participants, but this is the only step of the SIT that was not well understood. Our interview found that the clock image, to illustrate thirty minutes of non-consumption prior to testing, was the least understood part of the picture instruction. Other elements in the picture instructions (e.g., pictures and symbols illustrating not to eat prior to testing) were understood. Thus, participants understood they were not supposed to eat or drink etc. before testing, but not how long before. This appears to be a simple problem to solve using digital clock pictures as suggested by participants.

Through the post-simulation interview, a number of problems with the picture instructions were identified by the participants. These responses provide insight and explanation of the results for participants who performed steps correctly and incorrectly. Commonly identified issues with the picture instructions included that the pictures were not large enough, arrows (illustrating motions) were unclear, some of the participants suggested that pictures alone made some instructions unclear, and some of the symbols used in the picture instruction book were unfamiliar to some of the participants.

The post-simulation interview also provided participants with the opportunity to identify ways of improving the picture instructions. The main improvement suggested by the participants was to increase the size of the images in the instructions. The scale by which the images should be increased varied between participants and between instructions. Pictures with arrows and numbers required the greatest increase in size. A
few instructions contained symbols that were not well understood by the participants. A red circle surrounding a picture with a single red line through it was thought to be a universal symbol for “do not.” However, a common participant suggestion was to use a red X through the picture. The use of the timer also provided a problem for several participants. The kitchen timer was an unfamiliar object to the participants. While some participants were able to deduce how to use the timer from the picture instructions, other participants struggled to understand what the timer was and were unable to use it correctly. To combat this issue, an explanation of what the timer is should be given. Switching to a digital clock was suggested by participants.

The interviewers took notes on participants’ behavior while taking the simulation SIT. Thus, they also provided insight into areas of improvement for the picture instruction book. Similar to participant responses, the interviewers identified that the size of images was an issue. Interviewers noted that several participants were squinting at pictures, especially those including arrows and numbers. Thus, the size of some images should be increased. The interviewers also noted that some participants had trouble using the timer and suggested that they should give a more in depth explanation of how to use the timer prior to the simulation SIT.

**Study Limitations**

This study contained a few limitations. One limitation was that an opportunistic sample was used. The 25 participants were all members of FASDO and residents of the Temeke district of Dar es Salaam. It is possible that different results may have been obtained from participants from other districts of the city.
Another limitation was that only proxy measures were used to obtain information about the participants’ literacy levels. The literacy level of the study population was reported by FASDO staff members. Personal history questions in the pre-simulation interview were self-report measures that our study could not verify (i.e., age, school level, and HIV testing history).

**Future Research**

There are many possibilities for future research involving SIT in Sub-Saharan Africa. The picture instruction book developed for this study provides a good starting basis for creating usable instructions for under-tested populations. Many different groups and cultures exist within each Sub-Saharan country, many with their own languages and dialects. Thus, picture instructions provide away to overcome language barriers for HIV SIT. Further development of a picture instruction book is important for future investigations of SIT in Tanzania. A picture instruction book could also be developed for use among less literate people in other countries as well.

Video instructions are another possibility for reaching illiterate or non-Swahili speaking people in Tanzania. Many would not have access to a DVD player or computer to play the video instructions, but the video instructions could be shown to larger groups at community based organizations such as FASDO. Those who viewed the video instructions would then be given the SIT to conduct themselves at home.

**Summary**

Continuing research on SIT methods in Sub-Saharan Africa could be beneficial in preventing HIV/AIDS in the region. SIT provides another method of HIV testing that can combat some of the barriers to testing in that region of the world. Having SIT more
widely available could increase testing rates. However, SIT methods need to first be adapted for use in Sub-Saharan Africa. Studies, such as this one, should be conducted in the future to further improve SIT methods.
References


Appendix A

Figure 1A

![SIT Competence Fidelity](image)

*Figure 1*: Percentage of participants correctly performing procedures of the simulation self-implemented test.
Table 1A

95% Confidence Intervals for SIT Testing Procedures

<table>
<thead>
<tr>
<th>Testing Procedure</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Testing Procedures</td>
<td>- .43</td>
<td>0.57</td>
</tr>
<tr>
<td>Swipe Gums</td>
<td>0.44</td>
<td>0.82</td>
</tr>
<tr>
<td>Place in Test Tube</td>
<td>0.69</td>
<td>0.98</td>
</tr>
<tr>
<td>Set Timer/ Time Test</td>
<td>0.49</td>
<td>0.86</td>
</tr>
<tr>
<td>Interpret Results</td>
<td>0.50</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Appendix B

Critical Picture Instructions

Do not eat, drink or brush your teeth 30 minutes before taking the test.

Swipe the specimen stick along your upper and lower gums once.
Place the used specimen stick into the testing tube.

Set the timer to twenty minutes and wait.
A result with one red line means that you do not have to go to the doctor. Go to the doctor if you have a result with two red lines.