Measuring and Applying Motivational Constructs in a Brief Intervention for Reducing Harmful Alcohol use in ED Patients in Moshi, Tanzania

by

Deepti Agnihotri

Duke Global Health Institute
Duke University

Date: April 15, 2021
Approved:

_____
Catherine A. Staton, Supervisor

_____
João Ricardo Nickenig Vissoci

_____
Judith J. Boshe

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
in the Graduate School of Duke University

2021

ABSTRACT

Measuring and applying motivational constructs in a brief intervention for reducing harmful alcohol use in ED patients in Moshi, Tanzania

by

Deepti Agnihotri

Duke Global Health Institute
Duke University

Date:_____

Approved:

_____
Catherine A. Staton, Supervisor

_____
João Ricardo Nickenig Vissoci

_____
Judith J. Boshe

An abstract of a thesis submitted in partial
fulfillment of the requirements for the degree
of Master of Science in the Duke Global Health Institute
in the Graduate School of Duke University

2021

Abstract

Background: Self Determination Theory (SDT) conceptualizes human motivation in terms of a spectrum. However, literature is scarce on how to measure self-determination in different languages or how self-determination can influence the effectiveness of healthcare interventions. The aim of this study was to translate and culturally adapt a psychometric questionnaire on self-determination (TSRQ) as well as SMS booster messages for a Brief Intervention (BI) aimed at reducing harmful alcohol use among injury patients presenting at Kilimanjaro Christian Medical Centre (KCMC) in Moshi, Tanzania. Methods: A mixed-methods approach was used to evaluate the psychometric properties of the TSRQ and SMS booster messages. Likert-scale surveys were administered on expert panels to assess translation quality and adherence to theory. Results: Quantitative analyses confirmed that the Swahili translation of the TSRQ accurately reflected SDT constructs. Exploratory Factor Analysis (EFA) revealed a two-domain model had a better fit than the original three-domain TSRQ. Expert panel surveys indicated that the SMS booster messages maintained strong connections to tenets of SDT. Conclusion: This was the first study to conduct a cross-cultural validation of the TSRQ in Tanzania and the first to implement and assess motivational constructs in SMS booster messages for a BI to promote safe alcohol use. The TSRQ is a valid, clinically useful scale but could be improved with more items. SMS booster messages touch on many SDT constructs, affirming their motivational utility.

Contents

List of Tables

List of Figures

Acknowledgements

This thesis would not have been possible without the relentless efforts of the research team at KCMC. Thank you to all the research assistants and nurses who are the reason I had high-quality data to analyze as well as the expert panel participants who provided their valuable insight on this project.

I would also like to thank my committee, Dr. Catherine Staton, Dr. Joao Vissoci, and Dr. Judith Boshe for their continuous guidance and support throughout this process. Thank you for teaching me so much about research and beyond, pushing me past the boundaries I had set for myself. Without their mentorship, I would have never cultivated as many skills or as much confidence I have now to conduct high-quality research in an equitable manner.

I am also grateful for the members of the GEMINI research group, particularly Ashley Phillips, Nayara Caruzzo, and Anna Tupetz, who always answered my (usually 11th hour) questions with immense compassion and detail. Their empathy and support reminded me that I belonged even if I doubted that myself.

Of course, a huge, special shout out is due to Arthi Kozhuman, my cheerleader, confidante, emotional support (really therapist at times), and dear dear friend. Thank you for supporting me through all of my emotional, nervous, hot-mess moments and being the reality check I needed whenever I started to get too much into my own head. Thank you for always believing in me and entertaining my random outbursts about R and Ratatouille. I am so lucky to know you.

I would also like to thank the education team at DGHI, especially Lysa Mackeen and Laura Bey, for supporting me throughout my entire global health journey and watching me grow from a clueless undergrad to a slightly-less-clueless master's candidate. Thank you also to my mentors, Dr. Michel Landry and Dr. Osondu Ogbuoji for their tremendous support and guidance, supporting me through all of my curricular and extra-curricular research interests.

Finally, thank you to all of my dear friends and family, especially my mom, Rajani Agnihotri, uncle, Dr. Rameshwar Sharma, and friends, Trishul Nagenalli, Vincenzo Malo, Sanya Kochhar, Kinza Khan, Cindy Pan, Michelle Wong, Ralph Lawton, Maddie Wilkinson, Megha Guggari, Supriya Prabhakar, and Chris Look for always believing in me, reminding me that I have much to be proud of and be grateful for. Thank you for existing ♥

1. Introduction

1.1 Health Outcomes of Focus: Alcohol Use and Injuries

Injuries kill over 5 million people each year worldwide and account for about 9% of global mortality (WHO 2014). Injuries disproportionately impact lower- and middle-income countries, especially those in sub-Saharan Africa (Haagsma et al., 2016). Moreover, 27% of injuries are caused by harmful alcohol use (World Health Organization et al., 2018).

Harmful alcohol use kills more than 3 million people each year (WHO, 2018). Similar to injuries, the burden of disease for harmful alcohol use disproportionately falls on lower- and middle-income countries, specifically countries in Africa (Haagsma et al., 2016; Rehm et al., 2009; WHO, 2018; WHO, 2014). The alcohol industry expanding its commercial activities in African countries to boost sales can explain the shift towards greater alcohol use (Ferreira-Borges et al., 2017).

Within sub-Saharan Africa, Tanzania has notably higher rates of harmful alcohol use, the population consuming about 3 more litres per capita than the regional average (WHO 2018). In 2016, the prevalence of heavy episodic drinking, defined as the proportion of adult drinkers consuming five or more drinks (about 60 grams) in one sitting, was estimated at around 20.3% (33.4% in males, 7.7% in females) (WHO, 2018). Furthermore, the Kilimanjaro region has a higher rate of alcohol consumption than the rest of northern Tanzania (Francis et al., 2015; Meier et al., 2020). The prevalence rate of alcohol use disorders is estimated to be about 6.8% in Tanzania but about 10.5% in the Kilimanjaro region (WHO 2018, Francis et al., 2015). As of 2018, there was an excise tax on alcoholic

beverages but no national action plan or monitoring system for curbing harmful alcohol use and no regulations on alcohol advertising or sales (WHO, 2018).

Kilimanjaro Christian Medical Centre (KCMC) in Moshi is the third largest hospital in Tanzania, serving as the referral hospital for over 15 million urban and rural people in the northern region (*Kilimanjaro Christian Medical Centre*, n.d.; Zhao et al., 2020). KCMC is also a university teaching hospital for Kilimanjaro Christian Medical University College (KCMUCO) and has the highest clinical trauma patient management capacity in the Kilimanjaro region (Staton et al., 2017).

According to recent literature, there is a stigma associated with excessive alcohol use and is reflected in differences in self-reported alcohol use to KCMC providers and results of objective alcohol use tests (Meier et al., 2020; Staton et al., 2018). Moreover, there is a perceived lack of treatment options for alcohol use beyond counselling, but this is unsurprising given that alcohol treatment tends to be integrated within the broader health system in LMICs (Meier et al., 2020). However, KCMC runs a psychiatric clinic twice a week catered for individuals who experience harmful alcohol use. Nevertheless, there is limited data on what constitutes an effective intervention for reducing harmful alcohol use for the KCMC (and Moshi at-large) population.

1.2 Preventing Injuries by Curbing Alcohol Use: An M-Health Intervention

When a patient presents to the KCMC ED with an acute injury, they are screened for alcohol use disorders (AUDs). However, the main priority is injury treatment, which

often leads the AUD to be left unaddressed. Nevertheless, given KCMC's unique capacity to triage and treat harmful alcohol use, it is well suited for researching and piloting interventions to help curb the issue.

Thus, a brief intervention (BI), "Punguza Pombe Kwa Afya Yako" (PPKAY)/ "Reduce Alcohol for Your Health," was developed for injury patients at KCMC in 2019 to address patient alcohol use. Brief interventions (BIs) are short, healthcare provider-led sessions that use motivational interviewing techniques to discuss a patient's behavior (Landy et al., 2016). The BI developed for KCMC was culturally adapted to fit the Tanzanian region, highlighting the feasibility of adapting interventions in a region where treatment options of substance abuse may be limited (Zimmerman et al., 2020).

Moreover, personalized SMS booster messages that reiterate the message of a BI have been shown to increase the effectiveness of the BI (Maar et al., 2016). Additionally, SMS messages have already proven effective at reducing harmful alcohol use among young adults in the US but there is limited literature on whether this effectiveness extends to non-western regions as few studies have culturally adapted SMS messages to other languages (Suffoletto et al., 2014, 2016). Nevertheless, promising results from other SMS-based service delivery studies in Tanzania suggest SMS-based healthcare delivery may prove effective (Jeong, 2020). Hence, building on the BI, we developed and culturally adapted SMS booster messages to be sent to KCMC injury patients post-discharge.

1.3 Patient Self Determination: Could it Impact the BI?

Self Determination Theory (SDT) conceptualizes human motivation in terms of a continuum (Cook & Artino, 2016). The theory states that motivation varies not only in level but also type; the spectrum begins with apathy or a complete lack of motivation and ends with internal motivation where a person willingly completes tasks out of pure enjoyment (Deci & Ryan, 2015). The middle of the spectrum describes "extrinsic motivation" where an individual is motivated to complete an activity or task because of risk of punishment or reward, feelings of guilt or compulsion, or even goals (Deci & Ryan, 2015). The distinction between external and internal motivation can be ambiguous especially when people are motivated by faith or values. Nevertheless, a truly internal behavior may only be one that a person would do even if no one else was watching.

Internal motivation is prompted by three main feelings: relatedness - a sense of belonging or affiliation, competence - perceived ability to achieve, and autonomy - the extent to which one can control their own actions (Cook & Artino, 2016). According to SDT, the more these psychosocial needs are met, the more likely an individual is to be internally motivated to engage in a certain behavior or task.

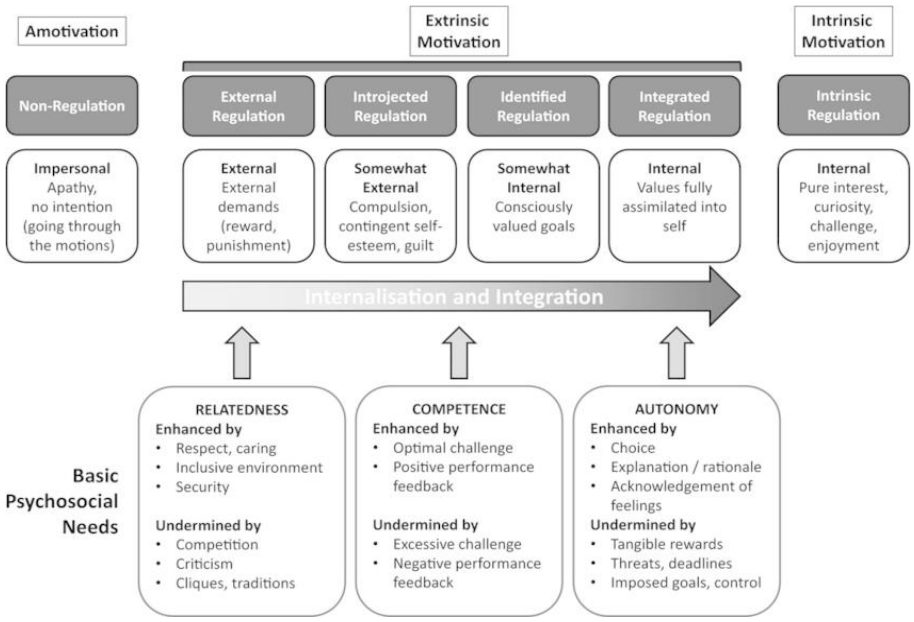

Figure 1: Self Determination Theory as described by (Cook & Artino, 2016)

Measuring an individual's level of self-determination or motivation is extremely valuable when trying to promote a health-related behavior change. Psychometric questionnaires such as the TSRQ assess patient self-determination specifically in the context of drinking behaviors. However, literature is scarce on how well the TSRQ can measure patient self-determination in languages other than English, and how self-determination can influence the effectiveness of new treatments in lower-middle income settings. The concept of SMS boosters also ties into SDT because they remind and encourage people to be healthy even after they have left the hospital.

1.4 Culturalization - Why it Matters

The field of global health is entrenched with power imbalances. Researchers from high-income countries often design and implement projects in low- and middle-income countries, mirroring the colonial relationships that were not necessarily deconstructed

with globalization (Abimbola 2019). It is important to be cognizant of these power structures and actively work to foster equity in the global health academic space. This project seeks to do just that, highlighting the importance of adapting health screening and promotion tools for the context they are to be used in. While this study was largely designed and analyzed in the United States, it was conducted in Tanzania under the guidance of Tanzanian healthcare professionals.

However, not only were appropriate translation and culturalization important for maintaining the desired message and behavior-change effect of the tools, but they were also an avenue for garnering Tanzanian input into the design of an internationally based study. If we are to dismantle the colonial power structures in global health, it is not enough to simply increase the diversity of a research team and proceed as usual. Diverse perspectives must inform how research is conducted. Case in point, the Tanzanian health professionals that lead KCMC advised the design of the intervention and trial to test it, not just its translation.

Moreover, it is critical to properly culturalize and adapt research tools for interventions to be effective and sustainable and for studies to be valid and reproducible. If a scale does not reliably and accurately measure the intended construct or latent variable, then resultant data will be uninformative at best and misleading at worst. In the same vein, if an intervention is designed and implemented in a language different from the one predominantly spoken in the study setting, then it is less likely to be accepted, adopted, and sustained.

Therefore, culturalization helps to create higher-quality research in a more participatory, equitable way.

1.5 Aims

The aim of this study was to assess the transferability and applicability of SDT to the Swahili Tanzanian setting. Hence, this study was conducted in three phases that focused on translating, measuring, and implementing motivational constructs.

1.5.1 Phase 1 Aim

The first aim of this study was to translate a psychometric questionnaire on self-determination from English to Swahili. Translation was considered successful if the Swahili version of this scale maintained as strong of a connection to the SDT regulation levels or psychosocial feelings as the English version.

1.5.2 Phase 2 Aim

The second aim was to validate the content of the questionnaire and assess its internal reliability to ensure the translated scale performed consistently.

1.5.3 Phase 3 Aim

The final aim of this study was to validate the content of SMS booster messages for a BI aimed at reducing alcohol use in terms of the degree to which the messages touched on SDT concepts and could promote behavior change. Our objective in validating the content of the questionnaire and SMS messages was to increase their utility for injury patients presenting at KCMC.

2. Methods

2.1 Ethical Statement

Duke University Medical Center Institutional Review Board, Kilimanjaro Christian Medical Center Ethics Committee and the Tanzanian National Institute of Medical Research approved this study.

2.2 Setting

This study took place in KCMC in Moshi, Tanzania. Moshi is comprised of both urban and rural districts with over 180,000 residents and has been the site of multiple studies focused on implementing and testing the utility of M-health based interventions (Erwin et al., 2019; Pima et al., 2019; Zhao et al., 2020). SMS has proven to be a feasible mode of healthcare delivery and data collection in Moshi with an over 50% response rate (Pima et al., 2019). Most Moshi residents are members of the Chagga, Pare, and Maasai ethnic groups and the primary language spoken is Swahili (Zhao et al., 2018).

The KCMC complex has over 600 beds, 1800 students, and 1300 staff, (Kilimanjaro Christian Medical Centre, n.d.). The KCMC Emergency Department (ED) admits over 2,000 injury patients annually, about 40% of whom test positive for alcohol use (Casey et al., 2012; Staton et al., 2018). Moreover, according to the KCMC TBI registry, 28% of traumatic brain injuries are alcohol related (Staton et al., 2018). The ED is staffed with at least four nurses per shift and three physicians provide care during the day, with an intern covering the department overnight (Casey et al., 2012). A logbook is maintained of every patient presenting for care (Casey et al., 2012).

2.3 Study Design

This was a three phase, mixed-methods study to understand the cultural and linguistic relevance of self-determination theory in an alcohol harm reduction mHealth-based intervention. In the first phase we translated the TSRQ to Swahili. In the second phase, the Swahili TSRQ was psychometrically validated. In the third phase, the SMS-based portion of a brief intervention to reduce alcohol use was validated. A combination of quantitative and qualitative measures was used for all three phases of the study.

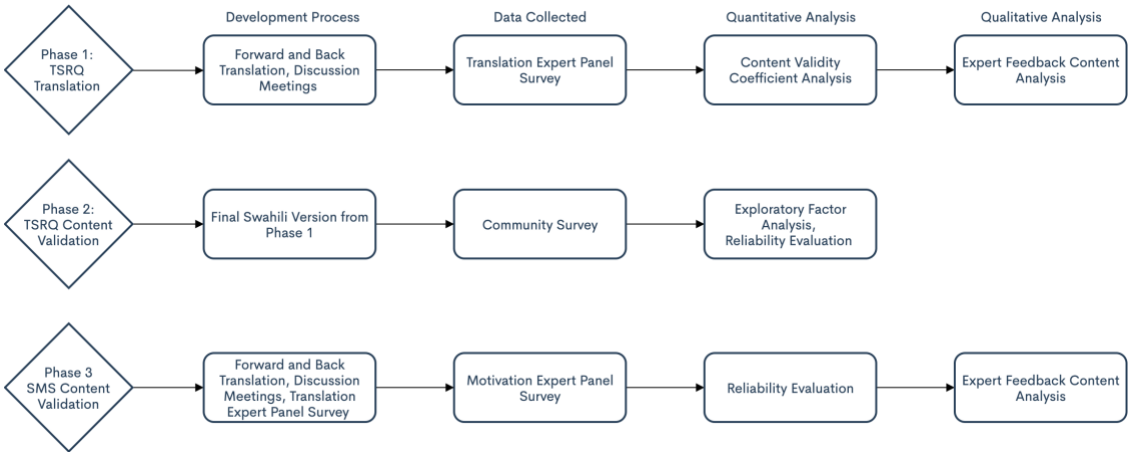

Figure 2: Flow diagram of three-phased study

2.4 Phase 1: TSRQ Translation

2.4.1 Phase 1 (and 2) Measures

The TSRQ is a 15-item scale designed to assess the degree to which a person's motivation to engage in certain health-related behaviors is autonomous or self-driven. The scale has been used to study behavior change in healthcare settings since 1996 and was first validated in the US in 2007 (Williams et al., 1996). The TSRQ was developed in English for an American setting but has been translated and validated in Spanish and Portuguese

(Marentes-Castillo et al., 2019; Marques et al., 2012). The TSRQ was chosen for this study over other self-determination scales because of its focus on individual behavior specifically for alcohol. Other scales, such as the Healthcare Climate Questionnaire (HCCQ) focused on the effects of overall environment or autonomy, which was related to, but not the primary focus of our study (Williams et al., 1996)

The TSRQ is originally designed to have three subscales or dimensions with items assessing amotivation, controlled motivation, and autonomous motivation. However, the amotivation subscale has not been frequently used in studies and is not always included in certain versions of the questionnaire because of the subscale's relative dearth of items (Williams et al., 1996); previous literature also suggests a two- or four-dimensional structure may perform better than the originally designed three dimensional model (Levesque et al., 2007; Marentes-Castillo et al., 2019). The scale is scored by averaging the responses of each dimension to reflect the autonomous, controlled, and amotivation for the target behavior. These three subscale scores can be used separately or together by subtracting the average of the controlled regulation responses from the average of the autonomous regulation responses to yield the Relative Autonomous Motivation Index (Williams et al., 1996).

2.4.2 Phase 1 Translation Procedures

The process of culturalizing the TSRQ for the Tanzanian population was based on the WHO 'Process of translation and adaptation of instruments' (WHO, n.d.). Because the TSRQ had been developed and validated in English, the questionnaire was translated

from English to Swahili through a series of forward- and back- translation meetings consisting of four research assistants (RAs) native to Tanzania and fluent in both English and Swahili. Two RAs forward translated the TSRQ and then the remaining two back translated the forward translation. Once an initial translation was set, a panel of 10 RAs discussed the translations and made necessary modifications until a group consensus was reached on a final version.

2.4.3 Phase 1 Expert Panel Participants

The expert panel to confirm domain fidelity of the TSRQ Swahili translation to the original English version consisted of six professionals who were fluent in English and Swahili and had expertise in mental health, injury prevention, and psychology.

2.4.4 Phase 1 Expert Validation Procedures

Once a translation was finalized, the Swahili version of the TSRQ was validated by the panel of six experts using an online survey in REDCap. The survey consisted of five-point Likert-scale questions to evaluate the content of the translated scale in terms of three criteria: (a) language clarity, (b) domain coherence, and (c) cultural pertinence as well as open-ended questions for the experts to submit written, qualitative feedback and suggestions for improvement.

2.4.5 Phase 1 Quantitative Analysis

Content validity refers to how well a scale operationalizes a theoretical construct (such as motivation), assuming the construct is well defined itself (Trochim, 2020). Recent

literature has established expert panel surveys as a mechanism to evaluate content validity, where the degree of agreement between expert raters serves as a quantitative reflection of the validity of the scale (Lorenzo-Lledó, 2020). Since the TSRQ had never been validated in Swahili, it was important to assess the content validity of the translated scale. After the expert panel survey was administered and participants' answers were compiled, content validity coefficients were evaluated to assess the validity of the TSRQ translation.

Content validity coefficients assess degree of agreement among experts in terms of each of the items (CVCi) and in terms of the instrument in general (CVCt) (Lorenzo-Lledó, 2020). Hence, a coefficient was calculated for each item (CVCi) in the TSRQ in terms of the three criteria listed in the expert panel survey as well as for the questionnaire in full (CVCt). To yield the CVCt, a coefficient for participants (CVCp) was calculated to reflect the experts' answering pattern and participants' polarization or error (Pp) was calculated for each item to reflect potential bias from the judges (Filgueiras et al., 2015).

Each item's CVCi was calculated by dividing the participants' answers by the maximum value of the scale and taking the mean of each participants' quotient. Coefficients for participants (CVCp) were calculated by summing the answers of each participant and dividing it by the maximum possible sum. Participants' polarization (Pp) was calculated as the reciprocal of the number of experts or 1 divided by the number of experts. Finally, the Pp was subtracted from each of the CVCps and the average of the differences yielded the CVCt (Filgueiras & Hall, 2017). CVCi and CVCt values above 0.80 indicated acceptable content validity (Filgueiras & Hall, 2017).

Content validity coefficients were calculated using Microsoft Excel.

2.4.6 Phase 1 Qualitative Analysis

Expert comments were submitted in English through the RedCAP survey and responses were exported into Excel to be analyzed by one research assistant.

Content analysis was conducted on the qualitative comments and suggestions submitted by the expert panel in the survey. Inductive coding was used to create a list of recurring concepts or themes (Thomas, 2003).

Qualitative content analysis and coding was conducted using Microsoft Excel.

2.5 Phase 2: TSRQ Content Validation

Once the TSRQ was translated and validated by the expert panel in phase 1, the scale was administered on a community sample of Moshi residents. The participant responses informed factor analyses and reliability metrics which evaluated the internal structure and performance of the scale.

2.5.1 Phase 2 Participants

Once the TSRQ was translated and validated by the expert panel in phase 1, the scale was administered on a community sample of Moshi residents who were NOT KCMC patients. Participants were recruited using convenience sampling (Staton, 2020) because the objective for data collection was not to represent a general population but rather to gather a wide variety of responses for testing the TSRQ in an easy, efficient way. Research personnel recruited participants by approaching people walking on the KCMC

compound or in grocery stores, markets, carwashes, bars, hair salons, colleges, and stadiums, and asking them to participate in a research project if they met the eligibility criteria (Staton, 2020).

Participants were enrolled in the study if they were:

- ≥18 years age
- fluent in Swahili
- lived in East Africa for the last 5+ years
- Could provide informed consent

Participants were excluded if they could not provide informed consent (Staton, 2020).

2.5.2 Phase 2 Content Validation and Reliability Procedures

Upon expert validation, the translated TSRQ was administered on the community sample. Missing and incomplete data were excluded to yield the final dataset. Exploratory Factor Analyses (EFA) were conducted to evaluate the internal structure of the TSRQ and to determine the number of latent variables underlying the scale. Reliability measures were also calculated to determine the consistency of the scale's performance across different participants.

2.5.3 Phase 2 Content Validation Analysis

EFA helps to empirically identify the latent variables or theoretical constructs that underlie a set of items in a given scale. In essence, EFA helps determine if a scale is

measuring the (relatively abstract) concepts (i.e. motivation) of interest. Given that this questionnaire was translated to Swahili for the first time, it was crucial to inspect the underlying structure and ensure that the translated version maintained the designed dimensions. EFA was used to test the internal structure of the TSRQ.

Scree tests, eigenvalues, root mean square standard errors, and cumulative variance helped establish the number of factors to retain in factor analyses. Hence, two-, three-, and four-dimensional models were evaluated to see which best represented the KCMC population.

Analyses were performed using the R Language for Statistical Computing software.

2.5.4 Phase 2 Reliability Analysis

A reliability evaluation helps to ensure that a scale is able to produce consistent results and produces the same score each time it is administered, all other things being equal (Revicki, 2014). Internal consistency is a specific measure of reliability and refers to the extent to which items designed to reflect a specific construct or latent variable produce similar results (Trochim, 2020). Internal consistency of a scale was calculated using the split half method, where the items are randomly divided into two groups and the correlation between each group's total score (sum of item score) is calculated (Trochim, 2020). The higher the correlation, the more confidently we can say that the items yield similar results and measure the same construct. Cronbach's alpha is the average of all possible split-half estimates (Trochim, 2020).

Cronbach's alpha coefficients are a measure of the internal consistency of a scale and use raw inter-item correlations to generate an overall value between 0 and 1 (Tavakol & Dennick, 2011). However, previous literature has shown that Cronbach's alpha can be unreliable or misleading with ordinal scales (Gajewski et al., 2007). Omega 6 coefficients, on the other hand, calculate inter-item correlations using the average extracted variances from factor analyses. Hence, both Cronbach's alpha and Omega 6 coefficients were used to measure the internal consistency of the TSRQ. With both measures, higher coefficient values indicate better internal consistency, but literature suggests that values of 0.7 or above reflect acceptable reliability (Tavakol & Dennick, 2011).

2.6 Phase 3: SMS Validation

While phase 1 and 2 assessed the linguistic and cultural relevance of SDT in terms of measuring self-determination, phase 3 focused on assessing the applicability of SDT constructs to a Swahili, SMS-based alcohol use intervention.

2.6.1 Phase 3 SMS Development and Translation

Development

Healthcare professionals from the US and Tanzania created SMS booster messages based on themes of self-awareness, goal setting, and motivation, encouraging patients to reduce their alcohol intake. The messages were developed in English and translated to Swahili by a team of research assistants at KCMC.

Translation and Back Translation

Two independent bilingual RAs native to Tanzania translated the messages from English to Swahili. Two other bilingual RAs then back-translated the messages from Swahili to English to ensure the SMS conveyed the same message. The researchers then compared the original messages with the back translated versions to identify discordances. If consensus could not be reached on how to adjust the translation, a third pair of RAs were invited to translate and back translate the messages.

Expert Validation

Once a consensus was reached on the translations and back translations, a focus group of Tanzanian experts was assembled to assess the clarity, quality, and cultural pertinence of the messages. Experts included physicians, professors, researchers, and healthcare providers. A REDCap survey was administered on a total of 16 experts.

Survey questions followed a five-point Likert scale, asking experts to rate each of the messages in terms of clarity, coherence with Tanzanian culture, and applicability to the daily activities and common sense of Tanzanian culture. Experts were also asked to rank all the SMS messages in terms of how likely they thought the message could influence someone to not drink. In addition to the quantitative questions, the survey also contained a qualitative portion where experts could suggest edits to each of the items.

Expert input was divided into three phases. Two experts reviewed the first version of the messages, offering comments and recommendations. Researchers then reconvened to review the comments and create a second version of the messages. The REDCap survey

was updated and administered on four more experts, who offered additional feedback and recommendations.

Upon expert validation and subsequent translation meetings to discuss flagged messages, a final list of the SMS messages was approved for use in Swahili

2.6.2 Phase 3 SMS Evaluation Procedures

The SMS messages were originally based on themes of goal setting, self-awareness, and motivation. While these themes relate to SDT constructs, the expert panel completed an online survey through REDCap, specifically evaluating the Swahili SMS messages in terms of

(a) the degree to which they promoted three psychosocial needs as described by SDT (on a Likert scale) and

(b) which of the five regulation factors the SMS best fit to

A qualitative portion also allowed experts to submit open-ended, written feedback and suggestions for improvement.

2.6.3 Phase 3 Expert Panel Participants

The SMS messages were evaluated by a separate panel of experts to evaluate how well the content of the translated messages adhered to SDT constructs. The panel consisted of six professionals who were fluent in English and Swahili and had expertise in mental health, injury prevention, and psychology.

2.6.4 Phase 3 Quantitative Analysis

Inter-rater reliability refers to how consistently different raters estimate the same construct (Trochim, 2020). Inter-rater reliability for categorical data is measured by the agreement between raters and is reflected by statistics such as Fleiss Kappa or Cohen's Kappa (Nichols et al., 2010). These statistics compare observed agreement to expected agreement by chance, making them well suited to ordinal data such as that given by the expert panel survey (Nichols et al., 2010). Unlike Cohen's Kappa, Fleiss Kappa is able to assess agreement between more than two raters (Nichols et al., 2010).

Inter-rater agreement between the expert survey participants was calculated using Fleiss' kappa. Kappa scores were calculated for each psychosocial feeling, regulation factor, and individual SMS.

Analyses were performed using the R Language for Statistical Computing software.

2.6.5 Phase 3 Qualitative Analysis

Expert comments were submitted in English through the RedCAP survey and responses were exported into Excel to be analyzed by one research assistant.

Content analysis was conducted on the qualitative comments and suggestions submitted by the expert panel in the survey. Inductive coding was used to create a list of recurring concepts or themes (Thomas, 2003).

Qualitative content analysis and coding was conducted using Microsoft Excel.

3. Results

3.1 Phase 1: TSRQ Translation

The CVCt for the full TSRQ was 4.815. The average CVCi value for each item ranged between 0.82 and 1.00. Questions with lower CVCi values tended to be part of the autonomous motivation subscale. Expert comments focused on clarity and using more precise wording to make the questions more applicable in Swahili.

Table 1: Expert Panel Evaluation of TSRQ Translation

Item	English Version	Swahili Version	Expert Comments	CVCi
	The reason I would use alcohol responsibly is:	Sababu zinazofanya nitumie pombe kwa nidhamu ni:	N/A	N/A
1	Because I feel that I want to take responsibility for my own health	Kwa sababu ninahisi kuwa ninahitaji kuwajibika kwa afya yangu mwenyewe	None	Language Clarity: 1.000 Domain Coherence: 0.967 Cultural Pertinence: 0.933
2	Because I would feel guilty or ashamed of myself if I didn't use alcohol responsibly	Kwa sababu ningejihisi mwenye hatia au kujiaibisha mwenyewe kama nisinge tumia pombe kwa nidhamu	None	Language Clarity: 0.933 Domain Coherence: 1.000 Cultural Pertinence: 1.000

3	Because I personally believe it is the best thing for my health	Kwa sababu mimi binafsi ninaamini ni jambo bora zaidi kwa afya yangu	None	Language Clarity: 0.933 Domain Coherence: 1.000 Cultural Pertinence: 0.933
4	Because others would be upset with me if I did not	Kwa sababu wengine wangenikasiriki a kama nisipo kunywa kwa nidhamu	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
5	I really don't think about it	Kwa kweli sifikirii kuhusu kunywa kwa nidhamu	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
6	Because I have carefully thought about it and believe it is very important for many aspects of my life	Kwa sababu nimefikiria kwa umakini juu ya hilo na ninaamini ni muhimu sana katika masuala mengi ya maisha yangu	I think the last part does not translate well in Swahili, it sounds a bit vague. Suggestion in Swahili below: Because I have carefully thought about it and believe it is very important as it affects other aspects of my life.	Language Clarity: 0.800 Domain Coherence: 0.900 Cultural Pertinence: 0.767
7	Because I would feel bad about myself if I did	Kwa sababu ningejisikia vibaya mimi mwenyewe kama	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000

	use alcohol responsibly	ningetumia pombe kwa nidhamu		
8	Because it is an important choice I really want to make	Kwa sababu ni chaguo muhimu sana ninalotaka kufanya	None	Language Clarity: 0.633 Domain Coherence: 1.000 Cultural Pertinence: 1.000
9	Because I feel pressure from others to do so	Kwa sababu ninahisi kushinikizwa na wengine kufanya hivyo	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
10	Because it is easier to do what I am told than to think about it	Kwa sababu ni rahisi kufanya kile ambacho nimeambiwa kuliko kufikiria juu ya hilo	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
11	Because it is consistent with my life goals	Kwa sababu inaendana na malengo yangu ya maisha yangu	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
12	Because I want others to approve of me	Kwa sababu ninataka wengine wanikubali	None	Language Clarity: 0.933 Domain Coherence: 0.933 Cultural Pertinence: 0.933
13	Because it is very important for being as healthy as possible	Kwa sababu ni muhimu sana kuwa na afya bora iwezekanavyo	A grammatical error	Language Clarity: 0.800 Domain Coherence: 0.967 Cultural Pertinence: 0.967

14	Because I want others to see I can do it	Kwa sababu ninataka wengine waone naweza kufanya hivyo	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000
15	I don't really know why	Kwa kweli sijui kwa nini	None	Language Clarity: 1.000 Domain Coherence: 1.000 Cultural Pertinence: 1.000

3.2 Phase 2: TSRQ Content Validation

3.2.1 Phase 2 Community Sample Demographics

The community sample to validate the internal structure of the TSRQ consisted of 76 participants from the Moshi Urban community.

Table 2: Demographic Profiles of 76-Person Community Validation Sample

Average Age	32.86 years (SD = 11.13)
Gender	47.4% female (n = 76)
Average Years of Education	10.68 years (SD = 4.10)

3.2.2 Phase 2 Factor Analysis

Scree plots suggested that a two or three factor model would perform best in factor analyses (Figure 2). Iterations of the EFA revealed that questions designed for the autonomous motivation domain consistently loaded onto the amotivation factor. The controlled motivation domain had more mixed results, with multiple questions cross-loading onto the autonomous or amotivation factors. Questions that touched more on

introjected regulation rather than external regulation (Q2, Q7, Q12) loaded more poorly on the controlled motivation domain.

Questions designed for the amotivation domain (Q5, 10, and 15) cross-loaded into multiple dimensions or did not load into any dimension at all. Questions 5 and 15 were excluded from subsequent EFAs question 10 was loaded onto the controlled motivation domain (Table 3).

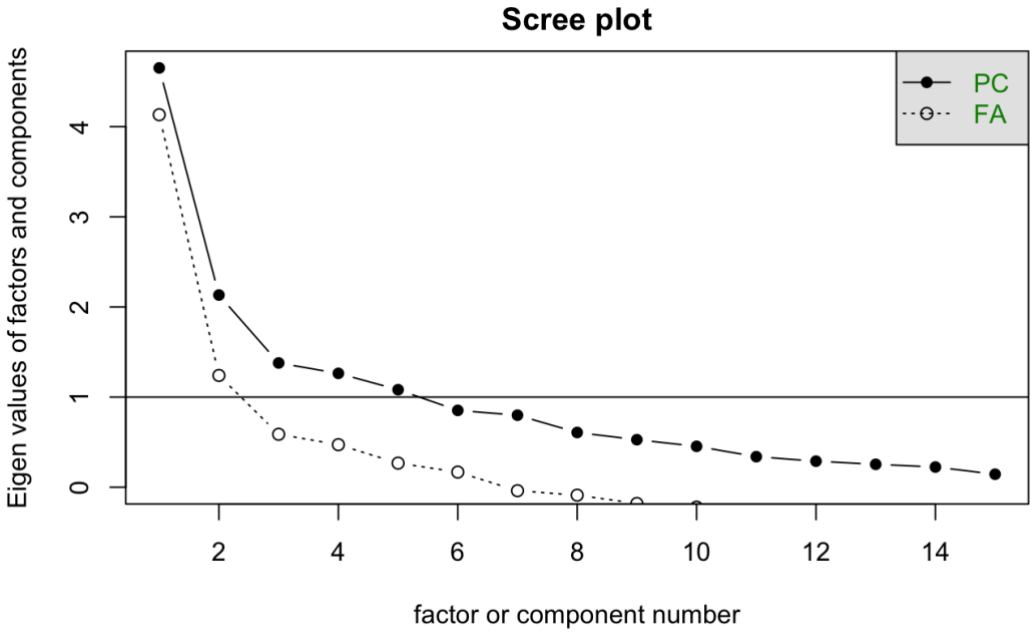

Figure 3: Scree Plot of Eigenvalues for TSRQ Community Survey Data

Table 3: Exploratory Factor Analysis Results for TSRQ Community Survey Data

Questionnaire Dimension	Questions	1 Factor	2 Factors		3 Factors			2 Factors Adapted	
Autonomous Motivation	tsrq1	0.75	0.72	0.09	0.77	0.19	-0.17	0.74	0.02
	tsrq3	0.84	0.89	-0.06	0.87	-0.15	0.13	0.87	-0.03
	tsrq6	0.74	0.80	-0.09	0.77	-0.19	0.16	0.79	-0.08
	tsrq8	0.69	0.70	-0.02	0.71	0.01	-0.05	0.75	-0.06
	tsrq11	0.63	0.55	0.23	0.60	0.31	-0.13	0.53	0.22
	tsrq13	0.77	0.73	0.11	0.72	0.07	0.08	0.68	0.16
Controlled Motivation	tsrq2*	0.60	0.57	0.09	0.61	0.19	-0.17	-	-
	tsrq4	0.36	0.21	0.41	0.17	0.21	0.50	0.23	0.39
	tsrq7*	0.11	0.12	-0.01	0.12	0.00	-0.02	-	-
	tsrq9	0.19	0.06	0.36	-0.01	0.15	0.57	0.03	0.41
	tsrq12*	0.20	-0.05	0.70	-0.01	0.70	0.12	-0.05	0.68
	tsrq14	0.28	0.04	0.68	0.08	0.63	0.17	-0.01	0.71
Amotivation	tsrq5	-0.20	-0.30	0.25	-0.26	0.39	-0.20	-	-
	tsrq10	0.22	0.05	0.46	0.01	0.29	0.47	0.05	0.45
	tsrq15	-0.32	-0.42	0.24	-0.42	0.19	0.12	-	-
% of Variance Explained		0.28	0.70	0.30	0.61	0.23	0.13	0.67	0.33

Table 4: EFA Factor Correlations

1 Factor	2 Factors		3 Factors			3 Factors Adapted	
MR1	MR1	MR2	MR1	MR2	MR3	MR1	MR2
N/A	1.00	0.22	1.00	0.14	0.20	1.00	0.26
-	0.22	1.00	0.14	1.00	0.08	0.26	1.00
-	-	-	0.20	0.08	1.00	-	-

Table 5: EFA Average Extracted Variance

	1 Factor	2 Factors	3 Factors	2 Factors Adapted
Autonomous Motivation	0.55	0.28	0.20	0.28
Controlled Motivation	0.11	0.14	0.11	0.17
Amotivation	0.06	0.10	0.09	0.10

3.2.3 Phase 2 Reliability Evaluation

Reliability values ranged above 0.80 for the autonomous domain, indicating adequate reliability and consistency for that subscale. Reliability values ranged between 0.60 and 0.75 for the controlled domain.

Table 6: TSRQ Reliability Evaluation

Reliability	Autonomous	Controlled (Full)	Controlled (Adapted)	Amotivation
Omega 6	0.88	0.57	0.675	0.20
Cronbach's Alpha	0.88	0.54	0.68	0.26

3.3 SMS Content Validation

Kappa scores indicated significant levels of agreement between raters on the relevance of both SDT psychosocial feelings and regulation factors to the content of SMSs. In terms of categorizing each SMS to specific regulation factors, raters were often split between two consecutive factors on the regulation spectrum, with few having full agreement on one factor and others being split among 2 or more divergent factors.

Table 7. Fleiss Kappa Scores for SMS in terms of SDT Psychosocial Feelings

Domain	**Fleiss' Kappa**
Relatedness	0.236
Competence	0.324
Autonomy	0.248

Table 8. Fleiss Kappa Scores for SMS in terms of SDT Regulation Factors

Domain	**Fleiss' Kappa**
External Regulation	0.521
Introjected Regulation	0.600
Identified Regulation	0.733
Integrated Regulation	0.694
Intrinsic Regulation	0.835

Table 9: Agreement on SDT Regulation Factors by SMS

SMS	**% of Raters who Classified SMS as Regulation Factor**				
	External	Introjected	Identified	Integrated	Intrinsic
1	33.33%	66.67%			

2			100%		
3	4/6	16.67%	16.67%		
4			100%		
5	33.33%	50%	16.67%		
6			100%		
7	16.67%				83.33%
8	33.33%	66.67%			
9		100%			
10		16.67%	83.33%		
11				33.33%	66.67%
12	33.33%	66.67%			
13			66.67%	33.33%	
14			100%		
15	100%				
16					100%
17			100%		
18				100%	
19	33.33%			66.67%	
20				100%	
21			33.33%	66.67%	
22		33.33%	66.67%		
23	66.67%		33.33%		
24		100%			

25			100%		
26					100%
27				33.33%	66.67%
28					100%
29	100%				

Table 10. SMS Examples by Regulation Factor

SDT Regulation Factor	SMS	SMS, Swahili
External Regulation	Surround yourself with others who support your choice to stop drinking. It just might help.	Jiweke na wengine wanaounga mkono chaguo lako la kuacha kunywa. Inaweza kusaidia.
Introjected Regulation	By controlling your drinking you are showing others how much self-discipline you have.	Kwa kudhibiti unywaji wako unaonyesha wengine ni jinsi ni kwa kiasi gani ulivyo na nidhamu.
Identified Regulation	Take control! Build up your strength by eating vegetables, drinking water, and sleeping.	Fanya udhibiti! Ongeza nguvu yako kwa kula mboga mboga, kunywa maji, na kulala.
Integrated Regulation	Set a goal and try to avoid alcohol on weekdays!	Weka lengo na jaribu kuzuia pombe siku za kazi!
Intrinsic Regulation	Identify what makes you desire to drink. Try to find other things that fulfill the desire without hurting your body.	Tambua ni nini kinachokufanya utamani kunywa. Jaribu kutafuta vitu vingine ambavyo vinatimiza hamu bila kuumiza mwili wako.

4. Discussion

This was the first study to conduct a cross-cultural validation of the TSRQ on alcohol use in Tanzania. Additionally, this study was the first to implement and assess motivational constructs in SMS booster messages for a BI to promote safe alcohol use among injury patients. To our knowledge, there is limited literature on cross-cultural adaptation at-large, so this study also helped to highlight strengths and weaknesses of the culturalization process (Marentes-Castillo et al., 2019; Marques et al., 2012).

4.1 TSRQ Cross Cultural Adaptation and the Validity of SDT

Overall, the TSRQ has shown to be a clinically valid tool that effectively and practically reifies the constructs of SDT in Swahili. This is significant because it extends the generalizability of SDT beyond the American English context it was developed in. Previous literature had adapted and validated the TSRQ in European and Middle Eastern languages, but this was the first study to adapt the TSRQ for a Bantu language (Ada et al., 2021; Marentes-Castillo et al., 2019; Marques et al., 2012). Moreover, while all TSRQ adaptation studies used a translation, back-translation approach to create the non-English version, this study was the first to conduct an expert panel analysis on the Swahili TSRQ after being forward and back translated; other studies used expert panels to conduct the forward and back translations themselves (Ada et al., 2021; Marentes-Castillo et al., 2019; Marques et al., 2012).

CVCi/CVCt analysis results suggest that the translated version of the TSRQ maintained fidelity to the original domains fairly well in a clear, coherent, and culturally

pertinent manner. The fact that the CVCt for the scale was well above 0.8 and the expert panel suggested minimal changes indicates that the Swahili version of the TSRQ can be used to measure personal motivations or inclinations to maintain low-risk alcohol use. Nevertheless, this translation process did reveal the importance of clarity in wording. The expert panel's comments focused on clarifying the message the questions were trying to convey and suggested using more literal phrasing in Swahili, highlighting the non-transferability of English idioms. These comments were a reminder of how idioms often originate and evolve in a culturally layered setting, limiting their use to specific languages or regions. However, the concrete experiences that underlie idioms are often relatable and just need to be described in a more culturally relevant way.

Overall, factor analyses revealed that the Swahili TSRQ could consistently distinguish autonomous motivation, sometimes detect controlled motivation, and could not reliably detect a lack of motivation.

EFA results revealed that a two-factor model with 11 items performed better than a three-factor model with 15 items even though the TSRQ was designed to have three dimensions. The two-factor model reflected dimensions of amotivation and controlled motivation, with questions designed to reflect amotivation not integrating well with either dimension. The amotivation dimension performed best with the factor loadings of all six original questions holding a value of at least 0.6 or higher. The controlled motivation dimension performed less well with certain items cross-loading into other dimensions or not loading at all. Analysis of the original questions revealed that all weakly-loading

controlled motivation questions reflected introjected regulation or somewhat-internalized motivation, blurring the distinction between complete external and internal motivation. Other studies have distinguished introjection as a fourth domain but these four-factor models did not perform well due to high correlation between the domains themselves (Levesque et al., 2007), reflecting the overall shortage of pure introjection questions.

The TSRQ was found to have acceptable internal reliability and consistency with Cronbach's alpha greater than 0.8 for the autonomous and greater than 0.6 for controlled dimensions. In addition to Cronbach's alpha, Omega 6 coefficients were calculated to assess the internal reliability of the scale, whose values also reflected excellent reliability for the autonomous dimension and acceptable reliability for the controlled dimension.

4.2 SDT Implementation Effectiveness through SMS

Overall, the Swahili SMS booster messages successfully implemented the different sub constructs of motivation as described by SDT into short, motivational reminders that could promote healthy drinking. Previous studies have successfully operationalized SDT constructs through SMS messages to promote physical activity, but this study was the first to do so to reduce harmful alcohol use (Kinnafick et al., 2016; Teixeira et al., 2012).

Fleiss' Kappa scores indicated high levels of agreement between raters when categorizing each SMS message in terms of the three psychosocial feelings described by SDT. In terms of regulation factor, raters had higher levels of agreement if a message was categorized as identified or intrinsic motivation. External and introjected regulation messages had lower levels of agreement. Of the 29 SMS messages, there was 100%

agreement for 12 messages on which regulation factor the message was best categorized. For nine messages, raters were split between two consecutive regulation factors on the SDT spectrum. In the remaining seven messages, raters were either split between three consecutive regulation factors or two nonconsecutive factors.

4.3 Culturalization Process

Culturalization is a multi-step, iterative process that is highly dependent on local stakeholder participation for success; it is extremely important not just for combatting colonial power-imbalances but also for making sure that research and interventions are effective and sustainable. For example, previous literature has shown that it is not enough to simply forward translate a scale once to be able to use it effectively in another language (Danielsen et al., 2015; Toma et al., 2017). When adapting and culturalizing scales for different countries and environments, it is important to undergo multiple rounds of translation and back translation with different translators, and assess translation quality, reliability, and validity using both qualitative and quantitative methods. (Danielsen et al., 2015).

Previous literature has shown that many different adaptation studies have followed different protocols depending on what the researchers found most useful (e.g. expert panel vs. participant evaluation, different types of reliability and validity measures, etc.) (Danielsen et al., 2015). However, such differing methodology only makes it harder to compare the results of adaptation studies and reduces the amount of information available to conclude whether adaptation was successful.

This study used a comprehensive approach for culturalization, skipping no steps in the WHO guidelines that methodically listed steps for iterative forward and back translation, qualitative validation, and quantitative validation. While similar results on multiple analyses (e.g. reliability evaluations, expert panel surveys) may suggest redundancy, the benefits of confirming results outweighed any costs and allowed us to more confidently conclude whether adaptation was successful.

At the same time, it is important to ask why culturalization is necessary to begin with. The need for culturalization could have been avoided by creating the SMS booster messages in Swahili instead of adapting them from English. By starting in Swahili, the messages would have automatically been culturally relevant and relatable. While there is value in using pre-existing English models that have been validated to accurately reflect theory, it is not necessarily fair to assume that starting in Swahili would have necessarily resulted in a lower adherence to theory. Future research should focus on creating tools in Swahili so they can be immediately tested on the Tanzanian population without needing to be translated or adapted.

4.4 Implications for Policy and Practice

Tanzania's disproportionate burden of harmful alcohol use and subsequent road-traffic injuries may be improved with mHealth interventions such as those described in this study. However, there remains a need for a national action plan against harmful alcohol use that helps reduce stigma and encourages seeking care in a non-ED setting.

4.5 Implications for Further Research

While the TSRQ is a valid tool, it would benefit from having more introjection or controlled motivation questions, allowing for greater distinction between dimensions and sub-analyses of the dimensions themselves. Future studies may create and evaluate such questions in addition to adapting and validating the TSRQ for other communities.

MHealth had already shown to be a promising modality for healthcare delivery in Tanzania and this study confirmed its utility in communicating the promotion of healthy behaviors outside of medical centers. However, it remains unclear how effective these messages may actually be in triggering behavior change. Further research should monitor the health outcomes of those KCMC injury patients who receive health-related SMS booster messages and compare them to those who do not. Additionally, participants' self-determination levels should be compared between those who receive the SMS boosters and those who do not. Finally, analyses should be conducted to evaluate whether self-determination is a mediator and/or moderator in the relationship between the BI+SMS treatment and alcohol use.

4.6 Study Strengths and Limitations

The external validity of this study is limited by the participant sample. The community participants of this study were drawn from residents of the Moshi-urban community who were not current patients at KCMC. This sample is unlikely to represent the whole Tanzanian population. Furthermore, the expert panels consisted of fewer than 10 professionals, all of whom were affiliated with KCMC or Duke in some fashion.

Therefore, the TSRQ should be further validated for use in other regions of Tanzania and future studies should call for more diversity in expert panels when culturalizing psychometric scales for clinical use.

5. Conclusion

This study shows the first validation of the Swahili version of the TSRQ and first implementation of motivational constructs in SMS booster messages for a BI. The TSRQ is a valid, clinically useful tool but could stand to benefit from more questions pertaining to controlled motivation or introjection. The TSRQ has also not been cross-culturally validated in other sub-Saharan languages. Therefore, future research should focus on improving the robustness of this tool in terms of measuring specific constructs of motivation in different communities. The SMS booster messages are promising in their ability to promote healthy behavior change by touching on different types of motivators. Future research should quantify their effectiveness in terms of alcohol-related injury admissions to the KCMC ED. Finally, if a study population was to receive both the TSRQ screen upon admission to the ED and SMS booster messages post-discharge, it would allow us to assess whether patient self-determination is a mediator or moderator on the relationship between the BI and alcohol use.

References

Abimbola, S. (2019). The foreign gaze: Authorship in academic global health. *BMJ Global Health*, *4*(5), e002068. https://doi.org/10.1136/bmjgh-2019-002068

Ada, E. N., Ahmad, H., Uzun, N. B., Jowett, S., & Kazak, Z. (2021). Cross-Cultural Adaptation of the Turkish and Kuwaiti Teacher–Student Relationship Questionnaire in Physical Education (TSRQ- PE Teacher Version): Testing for Measurement Invariance. *Sustainability*, *13*(3), 1387. https://doi.org/10.3390/su13031387

Almanasreh, E., Moles, R., & Chen, T. F. (2019). Evaluation of methods used for estimating content validity. *Research in Social and Administrative Pharmacy*, *15*(2), 214–221. https://doi.org/10.1016/j.sapharm.2018.03.066

Angus, C., Latimer, N., Preston, L., Li, J., & Purshouse, R. (2014). What are the Implications for Policy Makers? A Systematic Review of the Cost-Effectiveness of Screening and Brief Interventions for Alcohol Misuse in Primary Care. *Frontiers in Psychiatry*, *5*. https://doi.org/10.3389/fpsyt.2014.00114

Barnett, N. P., Apodaca, T. R., Magill, M., Colby, S. M., Gwaltney, C., Rohsenow, D. J., & Monti, P. M. (2010). Moderators and Mediators of Two Brief Interventions for Alcohol in the Emergency Department. *Addiction (Abingdon, England)*, *105*(3), 452–465. https://doi.org/10.1111/j.1360-0443.2009.02814.x

Casey, E. R., Muro, F., Thielman, N. M., Maya, E., Ossmann, E. W., Hocker, M. B., & Gerardo, C. J. (2012). Analysis of traumatic injuries presenting to a referral hospital emergency department in Moshi, Tanzania. *International Journal of Emergency Medicine*, *5*(1), 28. https://doi.org/10.1186/1865-1380-5-28

Cook, D. A., & Artino, A. R. (2016). Motivation to learn: An overview of contemporary theories. *Medical Education*, *50*(10), 997–1014. https://doi.org/10.1111/medu.13074

Cook, D., & Artino, A. (2016). Motivation to learn: An overview of contemporary theories. *Medical Education*, *50*, 997–1014. https://doi.org/10.1111/medu.13074

Danielsen, A. K., Pommergaard, H.-C., Burcharth, J., Angenete, E., & Rosenberg, J. (2015). Translation of Questionnaires Measuring Health Related Quality of Life Is Not Standardized: A Literature Based Research Study. *PLoS ONE*, *10*(5). https://doi.org/10.1371/journal.pone.0127050

Deci, E. L., & Ryan, R. M. (2008). Self-Determination Theory: A Macrotheory of Human Motivation, Development, and Health. *Canadian Psychology; Ottawa*, *49*(3), 182–185.

Deci, E. L., & Ryan, R. M. (2015). Self-Determination Theory. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 486–491). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.26036-4

Elzerbi, C., Donoghue, K., & Drummond, C. (2015). A comparison of the efficacy of brief interventions to reduce hazardous and harmful alcohol consumption between European and non-European countries: A systematic review and meta-analysis of randomized controlled trials. *Addiction*, *110*(7), 1082–1091. https://doi.org/10.1111/add.12960

Erwin, E., Aronson, K. J., Day, A., Ginsburg, O., Macheku, G., Feksi, A., Oneko, O., Sleeth, J., Magoma, B., West, N., Marandu, P. D., & Yeates, K. (2019). SMS behaviour change communication and eVoucher interventions to increase uptake of cervical cancer screening in the Kilimanjaro and Arusha regions of Tanzania: A randomised, double-blind, controlled trial of effectiveness. *BMJ Innovations*, *5*(1). https://doi.org/10.1136/bmjinnov-2018-000276

Ferreira-Borges, C., Parry, C. D. H., & Babor, T. F. (2017). Harmful Use of Alcohol: A Shadow over Sub-Saharan Africa in Need of Workable Solutions. *International Journal of Environmental Research and Public Health*, *14*(4). https://doi.org/10.3390/ijerph14040346

Filgueiras, A., Galvão, B. de O., Pires, P., Fioravanti-Bastos, A. C. M., Hora, G. P. R., Santana, C. M. T., Landeira-Fernandez, J., Filgueiras, A., Galvão, B. de O., Pires, P., Fioravanti-Bastos, A. C. M., Hora, G. P. R., Santana, C. M. T., & Landeira-Fernandez, J. (2015). Tradução e adaptação semântica do Questionário de Controle Atencional para o Contexto Brasileiro. *Estudos de Psicologia (Campinas)*, *32*(2), 173–185. https://doi.org/10.1590/0103-166X2015000200003

Filgueiras, A., & Hall, C. R. (2017). Psychometric properties of the Brazilian-adapted version of Sport Imagery Questionnaire. *Psicologia: Reflexão e Crítica*, *30*(1), 22. https://doi.org/10.1186/s41155-017-0075-7

Francis, J. M., Weiss, H. A., Mshana, G., Baisley, K., Grosskurth, H., & Kapiga, S. H. (2015). The Epidemiology of Alcohol Use and Alcohol Use Disorders among Young People in Northern Tanzania. *PloS One*, *10*(10), e0140041. https://doi.org/10.1371/journal.pone.0140041

Gajewski, B., Boyle, D. K., & Thompson, S. (2007, July 30). *Distribution of Cronbach's Alpha for Ordinal Data: A Bayesian-Based Approach*. JSM 2007 Online Preliminary

Program. https://ww2.amstat.org/meetings/jsm/2007/OnlineProgram/index.cfm?fuseaction=abstract_details&abstractid=308244

Haagsma, J. A., Graetz, N., Bolliger, I., Naghavi, M., Higashi, H., Mullany, E. C., Abera, S. F., Abraham, J. P., Adofo, K., Alsharif, U., Ameh, E. A., Ammar, W., Antonio, C. A. T., Barrero, L. H., Bekele, T., Bose, D., Brazinova, A., Catalá-López, F., Dandona, L., … Phillips, M. R. (2016). The global burden of injury: Incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013. *Injury Prevention*, *22*(1), 3–18. https://doi.org/10.1136/injuryprev-2015-041616

Hagger, M. S., & Chatzisarantis, N. L. D. (2009). Integrating the theory of planned behaviour and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology*, *14*(2), 275–302. https://doi.org/10.1348/135910708X373959

Hyrkäs, K., Appelqvist-Schmidlechner, K., & Oksa, L. (2003). Validating an instrument for clinical supervision using an expert panel. *International Journal of Nursing Studies*, *40*(6), 619–625. https://doi.org/10.1016/S0020-7489(03)00036-1

Jeong, D. (2020). *Reducing Job Search Costs with an SMS-based Messaging App in Rural Tanzania*. Abdul Latif Jameel Poverty Action Lab (J-PAL). https://www.povertyactionlab.org/evaluation/reducing-job-search-costs-sms-based-messaging-app-rural-tanzania

Kaner, E. F. S., Beyer, F., Dickinson, H. O., Pienaar, E., Campbell, F., Schlesinger, C., Heather, N., Saunders, J., & Burnand, B. (2007). Effectiveness of brief alcohol interventions in primary care populations. *The Cochrane Database of Systematic Reviews*, *2*, CD004148. https://doi.org/10.1002/14651858.CD004148.pub3

Kinnafick, F.-E., Thøgersen-Ntoumani, C., & Duda, J. (2016). The effect of need supportive text messages on motivation and physical activity behaviour. *Journal of Behavioral Medicine*, *39*, 574–586. https://doi.org/10.1007/s10865-016-9722-1

Landy, M. S. H., Davey, C. J., Quintero, D., Pecora, A., & McShane, K. E. (2016). A Systematic Review on the Effectiveness of Brief Interventions for Alcohol Misuse among Adults in Emergency Departments. *Journal of Substance Abuse Treatment*, *61*, 1–12. https://doi.org/10.1016/j.jsat.2015.08.004

Lau-Barraco, C., Braitman, A. L., Linden-Carmichael, A., & Stamates, A. L. (2018). Mediators and Moderators of a Personalized Feedback Alcohol Intervention for

Nonstudent Emerging Adult Drinkers. *Alcoholism, Clinical and Experimental Research*, *42*(9), 1756–1768. https://doi.org/10.1111/acer.13819

Lee, J. W., & Kang, K. (2019). Association of Basic Psychological Needs with Recovery Attitude in Inpatients with Alcohol Use Disorders based on the Self-Determination Theory. *Journal of Korean Academy of Psychiatric and Mental Health Nursing*, *28*(4), 344–352. https://doi.org/10.12934/jkpmhn.2019.28.4.344

Levesque, C. S., Williams, G. C., Elliot, D., Pickering, M. A., Bodenhamer, B., & Finley, P. J. (2007). Validating the theoretical structure of the Treatment Self-Regulation Questionnaire (TSRQ) across three different health behaviors. *Health Education Research*, *22*(5), 691–702. https://doi.org/10.1093/her/cyl148

Levira, F., & Todd, G. (2017). Urban Health in Tanzania: Questioning the Urban Advantage. *Journal of Urban Health : Bulletin of the New York Academy of Medicine*, *94*(3), 437–449. https://doi.org/10.1007/s11524-017-0137-2

Lorenzo-Lledó, A. (2020). Design and Validation of a Questionnaire to Measure Future Spanish Teachers' Perceptions of Cinema in Pre-School and Primary Education: Towards Active and Technological Learning. *Future Internet*, *12*(9), 149. http://dx.doi.org.proxy.lib.duke.edu/10.3390/fi12090149

Maar, M. A., Yeates, K., Toth, Z., Barron, M., Boesch, L., Hua-Stewart, D., Liu, P., Perkins, N., Sleeth, J., Wabano, M. J., Williamson, P., & Tobe, S. W. (2016). Unpacking the Black Box: A Formative Research Approach to the Development of Theory-Driven, Evidence-Based, and Culturally Safe Text Messages in Mobile Health Interventions. *JMIR MHealth and UHealth*, *4*(1). https://doi.org/10.2196/mhealth.4994

Marentes-Castillo, M., Zamarripa, J., Castillo, I., Marentes-Castillo, M., Zamarripa, J., & Castillo, I. (2019). Validation of the Grit Scale and the Treatment Self-Regulation Questionnaire (TSRQ) in the Mexican context. *Revista Latinoamericana de Psicología*, *51*(1), 9–18. https://doi.org/10.14349/rlp.2019.v51.n1.2

Marques, M., Gucht, V., Maes, S., Gouveia, M., & Leal, M. J. (2012). Psychometric Properties of the Portuguese Version of the Treatment Self-Regulation Questionnaire for Physical Activity (TSRQ - PA). *Psychology, Community & Health*, *1*, 212–220. https://doi.org/10.5964/pch.v1i2.32

Meier, B. J., El-Gabri, D., Friedman, K., Mvungi, M., Mmbaga, B. T., Nickenig Vissoci, J. R., & Staton, C. A. (2020). Perceptions of alcohol use among injury patients and their family members in Tanzanian society. *Alcohol (Fayetteville, N.Y.)*, *83*, 9–15. https://doi.org/10.1016/j.alcohol.2019.06.001

Mundenga, M. M., Sawe, H. R., Runyon, M. S., Mwafongo, V. G., Mfinanga, J. A., & Murray, B. L. (2019). The prevalence of alcohol and illicit drug use among injured patients presenting to the emergency department of a national hospital in Tanzania: A prospective cohort study. *BMC Emergency Medicine*, *19*(1), 15. https://doi.org/10.1186/s12873-019-0222-9

Myers, B., Stein, D. J., Mtukushe, B., & Sorsdahl, K. (2012). Feasibility and Acceptability of Screening and Brief Interventions to Address Alcohol and Other Drug Use among Patients Presenting for Emergency Services in Cape Town, South Africa. *Hindawi*, *2012*, 9. https://doi.org/10.1155/2012/569153

Nichols, T. R., Wisner, P. M., Cripe, G., & Gulabchand, L. (2010). Putting the Kappa Statistic to Use. *The Quality Assurance Journal*, *13*(3–4), 57–61. https://doi.org/10.1002/qaj.481

Pima, F. M., Oshosen, M., Ngowi, K. M., Habte, B. M., Maro, E., Teffera, B. E., Kisigo, G., Swai, I. U., Msangi, S. S., Ermias, A., Mmbaga, B. T., Both, R., & Sumari-de Boer, M. (2019). Feasibility of Using Short Message Service and In-Depth Interviews to Collect Data on Contraceptive Use Among Young, Unmarried, Sexually Active Men in Moshi, Tanzania, and Addis Ababa, Ethiopia: Mixed Methods Study With a Longitudinal Follow-Up. *JMIR Formative Research*, *3*(2), e12657. https://doi.org/10.2196/12657

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y., & Patra, J. (2009). Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *The Lancet*, *373*(9682), 2223–2233. https://doi.org/10.1016/S0140-6736(09)60746-7

Revicki, D. (2014). Internal Consistency Reliability. In A. C. Michalos (Ed.), *Encyclopedia of Quality of Life and Well-Being Research* (pp. 3305–3306). Springer Netherlands. https://doi.org/10.1007/978-94-007-0753-5_1494

Rodriguez, L. M., DiBello, A. M., Wickham, R., Hadden, B. W., Baker, Z. G., & Øverup, C. S. (2018). A self-determination theory approach to problematic drinking and intimate partner violence. *Motivation and Emotion*, *42*(2), 225–235. https://doi.org/10.1007/s11031-017-9655-1

Sorsdahl, K., Myers, B., Ward, C., Matzopoulos, R., Mtukushe, B., Nicol, A., & Stein, D. J. (2014). Screening and brief interventions for substance use in emergency departments in the Western Cape province of South Africa: Views of health care professionals. *International Journal of Injury Control & Safety Promotion*, *21*(3), 236–243. https://doi.org/10.1080/17457300.2013.811267

Staton, C. (2020). *PRACT Validation of Scales Survey SOP*. GEMINI. https://docs.google.com/document/d/15FWg60OqFHa5KJCifZc3G3Pb2WByqc_hK6ya6JYM4dM/edit?usp=embed_facebook

Staton, C. A., Msilanga, D., Kiwango, G., Vissoci, J. R., de Andrade, L., Lester, R., Hocker, M., Gerardo, C. J., & Mvungi, M. (2017). A prospective registry evaluating the epidemiology and clinical care of traumatic brain injury patients presenting to a regional referral hospital in Moshi, Tanzania: Challenges and the way forward. *International Journal of Injury Control & Safety Promotion*, *24*(1), 69–77. https://doi.org/10.1080/17457300.2015.1061562

Staton, C. A., Vissoci, J. R. N., Toomey, N., Abdelgadir, J., Chou, P., Haglund, M., Mmbaga, B. T., Mvungi, M., & Swahn, M. (2018). The impact of alcohol among injury patients in Moshi, Tanzania: A nested case-crossover study. *BMC Public Health*, *18*(1), 275. https://doi.org/10.1186/s12889-018-5144-z

Suffoletto, B., Kristan, J., Callaway, C., Kim, K. H., Chung, T., Monti, P. M., & Clark, D. B. (2014). A text message alcohol intervention for young adult emergency department patients: A randomized clinical trial. *Annals of Emergency Medicine*, *64*(6), 664-672.e4. https://doi.org/10.1016/j.annemergmed.2014.06.010

Suffoletto, B., Merrill, J. E., Chung, T., Kristan, J., Vanek, M., & Clark, D. B. (2016). A Text Message Program as a Booster to In-Person Brief Interventions for Mandated College Students to Prevent Weekend Binge Drinking. *Journal of American College Health : J of ACH*, *64*(6), 481–489. https://doi.org/10.1080/07448481.2016.1185107

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, *9*, 78. https://doi.org/10.1186/1479-5868-9-78

The World Bank. (2021). *Rural population (% of total population)—Tanzania | Data*. The World Bank Data. https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=TZ

Thomas, D. R. (2003). A general inductive approach for qualitative data analysis. *University of Auckland, New Zealand*, 11.

Toma, G., Guetterman, T. C., Yaqub, T., Talaat, N., & Fetters, M. D. (2017). A systematic approach for accurate translation of instruments: Experience with

translating the Connor–Davidson Resilience Scale into Arabic. *Methodological Innovations*, *10*(3), 2059799117741406. https://doi.org/10.1177/2059799117741406

Trochim, W. M. K. (2020a). Measurement Validity Types. In *Research Methods Knowledge Base*. Cengage Publishing. https://conjointly.com/kb/measurement-validity-types/

Trochim, W. M. K. (2020b). Types of Reliability. In *Research Methods Knowledge Base*. Cengage Publishing. https://conjointly.com/kb/types-of-reliability/

Vansteenkiste, M., & Sheldon, K. M. (2006). There's nothing more practical than a good theory: Integrating motivational interviewing and self-determination theory. *British Journal of Clinical Psychology*, *45*(1), 63–82. https://doi.org/10.1348/014466505X34192

Vissoci, J. R. N., de Oliveira, L. P., Gafaar, T., Haglund, M. M., Mvungi, M., Mmbaga, B. T., & Staton, C. A. (2019). Cross-cultural adaptation and psychometric properties of the MMSE and MoCA questionnaires in Tanzanian Swahili for a traumatic brain injury population. *BMC Neurology*, *19*(1), 57. https://doi.org/10.1186/s12883-019-1283-9

Walsh, J. A. N., Scott T. Walters, Abby L. Braitman, Michelle L. Kelley, James F. Paulson, Tegwyn H. Brickhouse, John C. Gunsolley, Michele L. Darby, Margaret F. Lemaster, J. Patrick Vandersluis, Margaret M. (2012). A brief motivational intervention for heavy alcohol use in dental practice settings: Rationale and development - James Alan Neff, Scott T Walters, Abby L Braitman, Michelle L Kelley, James F Paulson, Tegwyn H Brickhouse, John C Gunsolley, Michele L Darby, Margaret F Lemaster, J. Patrick Vandersluis, Margaret M Walsh, 2013. *Journal of Health Psychology*. http://journals.sagepub.com/doi/10.1177/1359105312452314?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub++0pubmed

WHO. (n.d.). *Process of translation and adaptation of instruments*. World Health Organization; World Health Organization. Retrieved September 30, 2020, from https://www.who.int/substance_abuse/research_tools/translation/en/

WHO. (2018). *Global status report on alcohol and health 2018*. World Health Organization.

Wild, C., & Cunningham, J. (n.d.). *When Do People Believe That Alcohol Treatment Is Effective? The Importance of Perceived Client and Therapist Motivation*. 8.

Williams, G. C., Ryan, R. M., & Deci, E. L. (1996). *Health-Care Self-Determination Theory Questionnaire*. Center for Self Determination Theory. https://selfdeterminationtheory.org/health-care-self-determination-theory/

Zhao, D., Nickenig Vissoci, J. R., Mmbaga, B. T., Abdullah, A. S., & Staton, C. A. (2020). Alcohol-Related Risky Behavior Patterns and Their Association With Alcohol Use and Perceived Alcohol Stigma in Moshi, Tanzania. *Journal of Studies on Alcohol and Drugs*, *81*(5), 614–623. https://doi.org/10.15288/jsad.2020.81.614

Zhao, D., Staton, C. A., He, Q., Mmbaga, B. T., & Vissoci, J. R. N. (2018). Cross-Culture Adaptation and Psychometric Properties of the DrInC Questionnaire in Tanzanian Swahili. *Frontiers in Public Health*, *6*. https://doi.org/10.3389/fpubh.2018.00330

Zimmerman, A., Pesambili, M., Phillips, A. J., Boshe, J., Mmbaga, B. T., Pantalon, M. H., Swahn, M., Hirshon, J. M., Vissoci, J. R. N., & Staton, C. A. (2020). Cultural Adaptation of a Brief Intervention to Reduce Alcohol Use Among Injury Patients in Tanzania. *Unpublished Manuscript*. https://docs.google.com/document/d/1__jdyxGPQ1wA30aXeHxMMXoG-dm_j5O3KF7W2gQrqX8/edit?usp=sharing&usp=embed_facebook