Changing handwashing behaviour in southern Ethiopia: A longitudinal study on infrastructural and commitment interventions

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A B S T R A C T

Improved hand hygiene efficiently prevents the major killers of children under the age of five years in Ethiopia and globally, namely diarrhoeal and respiratory diseases. Effective handwashing interventions are thus in great demand. Evidence- and theory-based interventions, especially when matched to the target population's needs, are expected to perform better than common practice. To test this hypothesis, we selected two interventions drawing on a baseline questionnaire-study that applied the RANAS (Risk, Attitudes, Norms, Abilities, Self-regulation) approach and focused on the primary caregivers of households in four rural, water-scarce kebeles (smallest administrative units of Ethiopia) in southern Ethiopia ($N = 462$). The two interventions were tested in combination with a standard education intervention in a quasi-experiment, as follows: kebele 1, education intervention, namely an f-diagram exercise, ($n = 23$); kebele 2, education intervention and public-commitment ($n = 122$); kebele 3, education intervention and tippy-tap-promotion (i.e. handwashing-station-promotion; $n = 150$); kebele 4, education intervention, public-commitment and tippy-tap-promotion ($n = 113$). In kebeles 3 and 4, nearly 100% of the households followed the promotion and invested material and time to construct for themselves a tippy-tap. Three months after intervention termination, the tippy-taps were in use with water and soap being present in up to 83% of the households (kebele 4). Pre-post data analysis on self-reported handwashing revealed that the population-tailored interventions, and especially the tippy-tap-promotion, performed better than the standard education intervention. Tendencies in observed behaviour and a recently developed implicit self-measure pointed to similar results. Changing people's hand hygiene is known to be a challenging task, especially in a water-scarce environment. The present project suggests not only to apply theory and evidence to improve handwashing interventions' effectiveness, but also emphasizes the relevance of tailoring interventions to the target population.

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1. Introduction

Improvements in hand hygiene efficiently prevent several major infectious illnesses, including diarrhoeal and respiratory diseases (Aiello et al., 2008; Cairncross et al., 2010). These are still the main causes of death in children younger than five years globally (Black et al., 2010). In Ethiopia, where the two diseases account for 38% of deaths in children below the age of five and for 25% of disability-adjusted life-years (World Health Organization Regional Office for Africa, 2010), handwashing rates are considerably low as in most developing countries (Federal Ministry of Health Ethiopia, 2011;

Scott et al., 2007). Effective handwashing programs are thus in great demand (Federal Ministry of Health Ethiopia, 2011; Global Public-Private Partnership for Handwashing with Soap, 2013).

Evidence-based interventions, namely interventions for which accepted empirical evidence of effectiveness is available (Davidson et al., 2003), are the exception in handwashing programs in developing countries (Aboud and Singla, 2012); more frequently implemented are interventions based on 'best practice' whose scope is often confined to educational approaches transferring knowledge (e.g. Global WASH Cluster, 2011). This comes into conflict (1) with findings that health knowledge and risk awareness do not necessarily translate into handwashing (e.g. Aunger et al., 2010) and (2) with studies questioning the effectiveness of educative handwashing interventions (e.g. Biran et al., 2009; Scott et al., 2007). Moreover, knowledge and risk perception are only of secondary importance in several major theories on health

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behaviour change (Conner and Norman, 2005). Correspondingly, there is evidence for the superiority of theory-based health behaviour interventions that aim to change behaviour by influencing the behavioural determinants defined within a specific theory over those lacking a theoretical underpinning (e.g. Taylor et al., 2011; Webb et al., 2010; but see also Prestwich et al., 2014). Furthermore, as each single theory identifies only a subset of potentially crucial behavioural determinants, it has been suggested that interventions, to be most effective, should consider a range of relevant theories (Abraham, 2012; Lippke and Ziegelmann, 2008; cf. Aboud and Singla, 2012). In line with this, a more recent approach to behaviour change in the water, sanitation and hygiene sector in developing countries subsumes the behavioural determinants specified in leading theories of behaviour change into a comprehensive framework, the RANAS (Risk, Attitudes, Norms, Ability, Self-regulation) approach (Mosler, 2012). The incorporated theories are the health belief model (Rosenstock, 1974), protection motivation theory (Rogers, 1975), social cognitive theory (Bandura, 1977), the theory of planned behaviour (Fishbein and Ajzen, 2010), and the health action process approach (Schwarzer, 2008). The RANAS model categorises the factors specified in these theories into five broader factor groups; risk factors, attitude factors, norm factors, ability factors, and self-regulation factors (see Table 1 for an overview of the factor groups and definitions of the factors). All these factors potentially determine whether a behaviour is adopted or not and might thus be targeted within interventions. The RANAS model's core asset is that for each factor it depicts specific behaviour change techniques (BCTs; smallest active components of a behaviour change intervention; Michie and Johnston, 2012) that are thought to change exactly this factor (see Table 1 for the intervention mapping; cf. Abraham and Michie, 2008; Michie and Johnston, 2012; Michie

et al., 2013). With that, it constitutes a solid basis for a theory- and evidence-based intervention selection.

What is more, the RANAS approach takes into account that the key factors determining a behaviour may vary between populations so that different interventions may be indicated for different populations. Accordingly, Mosler (2012) suggests applying interventions that are not only theory- and evidence-based but also population-tailored, meaning interventions that are matched to the key behavioural factors in a specific population, i.e. factors with a high improvement potential (s.a. Aboud and Singla, 2012; Abraham, 2012; Bartholomew et al., 2006). Therefore, to select interventions based on the RANAS approach, in a first step the behavioural factors with the highest improvement potential for a specific behaviour in a specific population have to be identified based on a structured survey. A factor's improvement potential is high, when the factor is a key determinant of the specific behaviour in the specific population (to be assessed e.g. by means of regression analysis) and when the factor is also highly positively changeable (i.e. when the population's majority deviates from the ideal value that is expected to facilitate behaviour change; e.g. on average beneficiaries feel low in self-efficacy and think that they are not able to always wash hands with soap at key times). These factors, as they determine the behaviour in the specific population and as they have room to improve, are most likely to facilitate behaviour change and should thus be targeted in interventions. Accordingly, in a second step the BCTs that are mapped in the RANAS model to exactly these determinants should be selected for intervention development.

In brief, the RANAS approach's key assumption is that the most effective interventions are not only theory- and evidence-based but also tailored to the specific population (Mosler, 2012). To test this assumption, the present study investigated whether theory- and

Table 1
Overview of the factors subsumed in the RANAS model and the linked behaviour change techniques (adapted from Mosler, 2012).

Behaviour change techniques	Factor groups and factors' definitions
Information interventions • Presentation of facts/knowledge transfer • Personal risk information • Showing scenarios • Fear arousal	Risk factors • Perceived vulnerability: subjective perception of the individual risk of contracting a disease • Perceived severity: subjective perception of the seriousness of a disease's individual consequences • Factual knowledge: knowledge about a disease's causes and consequences and its prevention
Persuasive interventions • Persuasive arguments • Persuasive peripheral cues • Affective persuasion	Attitude factors • Instrumental beliefs: a behaviour's advantages, e.g. health or status improvements, and disadvantages, e.g. time and monetary costs • Affective beliefs: feelings arising when thinking about or performing a behaviour
Normative interventions • Highlighting norms • Public commitment • Anticipated regret	Norm factors • Descriptive norm: behaviours typically practiced by others • Injunctive norm: behaviours typically approved or disapproved by others • Personal norm: personal standards about dos and don'ts
Infrastructural and ability interventions • Knowledge transfer (education) • Guided practice • Facilitating resources (financing) • Social help • Modeling/vicarious reinforcement • Coping with barriers • Coping with relapse	Ability factors • Action knowledge: knowledge about how to perform a behaviour • Motivational self-efficacy: confidence in one's ability to initiate and execute a behaviour • Volitional self-efficacy: confidence in one's ability to maintain a behaviour in light of barriers and to recover from relapse • Impediments: anticipated barriers and distractions to a behaviour
Planning interventions and relapse prevention • Daily routine planning • Outcome feedback • Contingency management • Stimulus control • Forming implementation intentions • Prompts/Reminders	Self-regulation factors • Action control: self-monitoring and efforts carried out to execute a behaviour according to standards set for oneself • Action planning: detailed planning of a behaviour's execution including the specification of 'when', 'where' and 'how' • Coping planning: establishing plans to overcome anticipated barriers and distractions to a behaviour • Remembering: ease of remembering a behaviour at a specific time/in a specific situation • Commitment strength: strength of commitment towards practicing a behaviour