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- Contextual and psychological predictors of habitual cleaning are identified
- Evidence-based behavior change interventions are derived

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Contextual and sociopsychological factors in predicting habitual cleaning of water storage containers in rural Benin

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Abstract Recontamination of drinking water occurring between water collection at the source and the point of consumption is a current problem in developing countries. The household drinking water storage container is one source of contamination and should therefore be cleaned regularly. First, the present study investigated contextual factors that stimulate or inhibit the development of habitual cleaning of drinking water storage containers with soap and water. Second, based on the Risk, Attitudes, Norms, Abilities, and Self-regulation (RANAS) Model of behavior, the study aimed to determine which sociopsychological factors should be influenced by an intervention to promote habitual cleaning. In a cross-sectional study, 905 households in rural Benin were interviewed by structured face-to-face interviews. A forced-entry regression analysis was used to determine potential contextual factors related to habitual cleaning. Subsequently, a hierarchical regression was conducted with the only relevant contextual factor entered in the first step ($R^2 = 6.7\%$) and the sociopsychological factors added in the second step ($R^2 = 62.5\%$). Results showed that households using a clay container for drinking water storage had a significantly weaker habit of cleaning their water storage containers with soap and water than did households using other types of containers ($\beta = -0.10$). The most important sociopsychological predictors of habitual cleaning were commitment ($\beta = 0.35$), forgetting ($\beta = -0.22$), and self-efficacy ($\beta = 0.14$). The combined investigation of contextual and sociopsychological factors proved beneficial in terms of developing intervention strategies. Possible interventions based on these findings are recommended.

1. Introduction

Unsafe drinking water is one of the main causes of diarrhea, and therefore one of the causes of child mortality [Prüss-Üstün *et al.*, 2008]. The number of people drinking water from unimproved water sources is estimated at 748 million [WHO and UNICEF, 2014], which corresponds to more than one-tenth of the world's population. According to Prüss-Üstün *et al.* [2008], improvements in drinking water quality, sanitation, and hygiene could prevent more than 9% of the global disease burden. Yet, as Günther and Schipper [2011] showed in Benin, improving water sources alone does not reduce diarrhea morbidity. Indeed, recontamination of drinking water after collection at the water source is a current problem in Benin [Günther and Schipper, 2013]. Various studies in other countries have shown as well bacteriological recontamination of water at different points between water collection at the source and the point of consumption [John *et al.*, 2014; Gundry *et al.*, 2006; Rufener *et al.*, 2010; WHO, 2007; Wright *et al.*, 2004; Levy *et al.*, 2008]. That is, even if we assume that all improved water sources in fact provide clean drinking water, the number of people consuming unsafe water increases as a consequence of recontamination between water source and point of use. Thus, access to a safe water source only assures consumption of safe water if the latter is handled hygienically [WHO, 2007]. Given the fact, that most households in developing countries do not have a water tap and that people collect water at a distant source, transporting it home and storing it at the household level—where they often serve themselves by dipping a cup into the stored water—there is a risk of bacteriological water recontamination at several points. One risk point is the container in which the water is stored. There is a significant reduction of water quality in storage vessels compared to the quality at the source [Gundry *et al.*, 2006; John *et al.*, 2014]. The higher rate of bacteriological contamination in cases where there are two different containers used for transport and storage [Lindskog and Lindskog, 1988] as well as the highly polluted interior of storage containers found by Ahmed *et al.* [1998] reinforce the assumption that storage containers are a cause of contamination. Harris *et al.* [2013] stated an increase in microbial contamination of the water after filling it in a container at the source. The authors suggest testing possible

interventions fostering proper cleaning of water containers. In fact, *Gasana et al.* [2002] measured less bacteriological pollution in households' stored water when storage containers were cleaned more often. Observations in different countries revealed that storage containers were not regularly cleaned before being filled with water, and were even less often cleaned with a detergent [*Gorter et al.*, 1998; *John et al.*, 2014; *Rufener et al.*, 2010; *Trevett et al.*, 2005]. These findings illustrate the need to enhance the cleaning of storage containers used for drinking water; even more, as safe water storage is recommended by the WHO [2007] as a cost-effective method to assure drinking water quality. While the literature shows various interventions related to the type of container used for water storage [*Günther and Schipper*, 2013; *Quick et al.*, 2002; *Sobsey et al.*, 2003], little attention has been paid to the promotion of cleaning storage containers. *Hamoudi et al.* [2012] found that the frequency of cleaning storage vessels increased in India after information intervention was provided on how to improve water quality. Yet, for a sound development of interventions, it is essential to investigate the underlying behavioral determinants of the cleaning of storage vessels.

The Risk, Attitudes, Norms, Abilities and Self-regulation (RANAS) Model of behavior [*Mosler*, 2012] suggests different factors to be considered. The model divides sociopsychological factors from several behavior change theories, into five factor blocks: Risk factors include the perceived health risk and the perceived consequences in case of disease. Attitude factors are the beliefs about the benefits and efforts related to the behavior as well as emotions. Norm factors stand for social influences. Ability factors are the perception about one's personal ability to execute the behavior, and, finally, self-regulation factors have an influence on its maintenance.

Several studies have confirmed the influence of the aforementioned factors on behavior in the water domain in developing countries [*Inauen et al.*, 2013; *Tamas and Mosler*, 2011; *Tobias and Berg*, 2011]. However, in a systematic review, *Dreibelbis et al.* [2013] point out the lack of contextual and technological factors in behavior change theories, that is, the respective characteristics of the setting, the individual, the environment, and the technology or device. Indeed, by focusing only on sociopsychological factors, there is the risk of ignoring the possible influence of other factors that might facilitate a given behavior: the type of container as well as its volume could have an influence on the difficulty of cleaning it. A wide-mouthed container, for instance, might be easy to clean, whereas a voluminous container might require complicate behavior. The frequency of water treatment at the household level, and whether or not the stored water is covered, could also have an influence. Not only might existing behaviors stimulate other hygiene-related behaviors but also, on the contrary, people might think treating the water renders cleaning unnecessary. Further, soap availability at the household level facilitates the use of soap for cleaning. In addition, demographical factors such as age, education, religion and the socioeconomic situation of the household, as well as its size in terms of household members, should be considered. As, in nearly all cases, the women are responsible for water handling in the household, gender seems less interesting in this context.

A further concern of *Dreibelbis et al.* [2013] is the consideration of habit beyond the simple frequency of a behavior. According to *Verplanken* [2006], habit is more than frequency alone, as it additionally includes automaticity and reduced cognitive effort; moreover, it mediates between past and future behavior. Hygiene behaviors in particular, require habitual practice over time, as a single execution does not lead to better health. In line with the concern of considering contextual factors, *Verplanken and Wood* [2006] suggest that for changing old habits into new ones, contextual triggers need to be changed in favor of the desired behavior as a first step. Therefore, a precedent identification of those triggers is essential.

In the present study, answers were sought for two research questions. The first is are there contextual factors that stimulate or inhibit the development of habitual cleaning? The second is which sociopsychological factors should an intervention target, to promote the habitual cleaning of drinking water storage containers with soap and water?

2. Methods

2.1. Design

In July 2013, we conducted a cross-sectional study in two of the 77 communes in Benin: Lokossa in the South and Djougou in the north of the country. In both communes, villages were randomly selected in all of the commune's subdivisions, the *arrondissements*. Because of big differences in population between the two communes as well as between *arrondissements*, the sample was adjusted relative to their size. In

Table 1. Contextual Factors of the Household and Characteristics of the Respondent^a

Variables	Scale (Min/Max)	<i>M</i>	<i>SD</i>	<i>n</i>	
Number of persons living in the household		8.45	5.60	903	
Age of respondent (years)		36.19	12.9	593	
Length of water storage (days)		3.20	3.07	904	
Volume of storage containers		95.09	67.42	901	
Frequency of water treatment	0–1 (five-point scale)	0.13	0.26	905	
Household's socioeconomic status	0–1 (index)	0.48	0.21	880	
Frequency of radio listening	0–1 (five-point scale)	0.54	0.32	904	
Frequency of TV watching	0–1 (five-point scale)	0.16	0.26	904	
				<i>n</i>	%
Religion (% Islam)				898	55.9
Religion (% Christianity)				898	30.0
Religion (% animist religions)				898	14.2
Type of storage container (% clay container)				901	67.9
Type of storage container (% plastic bucket)				901	23.0
Type of storage container (% jerry can)				901	5.7
Literacy (% able to read and write)				900	13.6
Coverage of stored water (% covered)				874	80.2
Current availability of soap in the household (% available)				903	97.8

^aAll five-point rating scales initially reached from 0 to 4. For data analysis, they were transformed in scales from 0 to 1. *M* = mean; *SD* = standard deviation.

Djougou, 632 households in 15 villages, and in Lokossa, 273 in 9 villages were interviewed. The country is characterized by a heterogeneous population in terms of religion, language, and ethnicity, not only between but also within communes.

2.2. Sample

All households of the sample had access to a functional improved water source. For practical reasons, the village had to be accessible during the rainy season. The households were selected by the random route method [Hoffmeyer-Zlotnik, 2003], including every third household. In the present study, a household was defined in terms of separate drinking water management, which normally consisted of a woman with her children. Thus, a polygamous man could be the head of more than one household. The interviews were conducted with the respective person responsible for the management of drinking water in the household.

2.3. Data Collection

Structured face-to-face interviews with a length of approximately 1 h were conducted with the person responsible for drinking water in the household. The population was previously informed about the interviews by the village chief. Seven interviewers in Lokossa and 13 in Djougou followed were trained for 5 days on the questionnaire. All interviewers were fluent in French and in at least one of the four local languages, so that all respondents could be interviewed in their native language. A local field coordinator and the research team supervised the interviewers during data collection.

The questionnaire comprised items concerning the sociopsychological factors regarding hand washing and hygienic water transport and storage, based on the RANAS Model of Mosler [2012] as well as items about health state, latrine access, and sociodemographic information. Additionally, it included hygiene spot checks, that is, rapid observations of the household's hygienic situation (e.g., whether the stored drinking water was covered).

During the trainings, the interviewers translated the questionnaire together with the researcher into the respective local languages to make sure that everyone would be using the same terms. The questionnaire was pretested at the end of both interviewer trainings.

2.3.1. Habitual Cleaning

The habitual cleaning of drinking water storage containers with soap and water was measured on a self-reported five-point rating scale: 0 = not a habit at all; 0.25 = weak habit; 0.5 = medium habit; 0.75 = strong habit; 1 = very strong habit (see Table 2).

2.3.2. Contextual Factors

Contextual factors were measured on binary, ordinal, and interval scales (see Table 1). Frequency of water treatment was measured on a five-point rating scale from "0 = (almost) never" to "1 = (almost) always."

Table 2. Frequencies of Habitual Cleaning and Sociopsychological Factors^a

	Variables	Wording	Scale (Min/Max)	M	SD
Risk Factors	Habitual cleaning	How much do you feel that you clean your water storage container with soap and water as a matter of habit?	0 = not a habit at all; 1 = very strong habit (5 pt)	0.69	0.25
	Perceived vulnerability	How high do you feel the risk is that you will get diarrhea?	0 = no risk; 1 = very high risk (5 pt)	0.35	0.23
	Perceived vulnerability (child)	How high do you feel the risk is that one of your children will get diarrhea?	0 = no risk; 1 = very high risk (5 pt)	0.51	0.27
	Perceived severity	Imagine that you contracted diarrhea. How severe would the impact be on: Your life in general? Your social life? Your economic situation?	0 = not severe at all; 1 = very severe (5 pt)	0.63 0.60 0.70	0.26 0.26 0.25
Attitude Factors	Instrumental beliefs (response efficacy)	How certain are you that cleaning your water storage container with soap and water prevents you and your family from getting diarrhea?	0 = not sure; 1 = very sure (5 pt)	0.73	0.22
	Instrumental beliefs (effort)	How effortful is it to clean your water storage container with soap and water?	0 = no effort; 1 = a lot of effort (5 pt)	0.27	0.41
	Affective beliefs (cleaning)	How much do you like or dislike cleaning your water storage container with soap and water?	(−1) = I do not like it at all; 1 = I like it a lot (9 pt)	0.71	0.32
	Affective beliefs (taste)	How much do you like or dislike the taste of water from a water storage container cleaned with soap and water?	(−1) = I do not like it at all; 1 = I like it a lot (9 pt)	0.65	0.39
Norm Factors	Descriptive norm	How many people of your <i>localité</i> do you think clean their water storage container with soap and water?	0 = (almost) nobody; 1 = (almost) all (5 pt)	0.53	0.27
	Injunctive norm	People who are important to you, do they approve or disapprove that you clean your water storage container with soap and water?	(−1) = all disapprove; 1 = all approve (9 pt)	0.69	0.29
	Personal norm	How much do you feel a personal obligation to clean your water storage container with soap and water?	0 = no personal obligation; 1 = very strong personal obligation (5 pt)	0.62	0.29
Ability Factors	Self-efficacy	How much do you think you are always able to clean your water storage container with soap and water?	0 = not at all; 1 = very much (5 pt)	0.74	0.20
	Maintenance self-efficacy	How confident are you that you can clean your water storage container with soap and water even if urgent tasks arise that interferes with cleaning the container?	0 = not confident at all; 1 = very confident (5 pt)	0.67	0.22
	Recovery self-efficacy	Imagine that you have not cleaned your water storage container with soap and water for several days (e.g., because you didn't have soap for cleaning). How confident are you that you will start cleaning the container with soap and water again?	0 = not confident at all; 1 = very confident (5 pt)	0.69	0.24
Self-Regulation Factors	Forgetting	How often does it happen that you forget to clean your water storage container with soap and water?	0 = (almost) never; 1 = (almost) always (5 pt)	0.27	0.31
	Commitment	How important is it for you to clean your storage container with soap and water?	0 = not important; 1 = very important (5 pt)	0.77	0.22
	Action planning	How do you make sure that you always have soap and water for cleaning your water storage container?	0 = no or bad plan; 1 = good plan (dichotomous)	48.0	52.0
	Coping planning	Do you have a plan what to do if there is no soap for cleaning your water storage container?	0 = no or bad plan; 1 = good plan (dichotomous)	67.9	32.1

^aAll rating scales initially reached from 0 to 4 for unipolar scales and from 0 to 8 for bipolar scales. For data analysis, they were transformed into scales from 0 to 1 and −1 to 1. For unipolar five-point scales, 0 indicates a low value on the scale, and 1 represents a high value. For bipolar nine-point scales, −1 and 1 represent the two extremes of the scale, and 0 represents the neutral value. For “action planning” and “coping planning,” the percentages of people who had “no or a bad plan” are given in the first column, and percentage of those who had a “good plan” in the second. *M* = mean; *SD* = standard deviation.

Frequencies of radio listening and TV watching were measured on a five-point rating scale from “0 = never” to “1 = every day.” For the socioeconomic situation of the household, an ownership index was created in order to measure wealth. The self-reported ownership of a radio, television, refrigerator, bicycle, car, motorcycle, telephone, table, chair, and clock as well as having electricity in the house were summed up and divided by the possible maximum of 11. The new scale reaches from “0 = low socioeconomic status” to “1 = high socioeconomic status.” For the different religions and types of storage containers, dummy variables were created, as well as for whether the respondent can read and write. The observation of whether or not the stored water was covered completed the otherwise self-reported factors.

2.3.3. Sociopsychological Factors

Sociopsychological factors were measured with one to three items. Their means constituted the factor values. Answer scales were either unipolar on a five-point rating scale (0–1) or bipolar on a nine-point rating scale (−1 to 1). Action planning and coping planning were measured with an open question (see Table 2).

Answers were classified in “no or bad plan” and “good plan,” according to their usefulness for achieving their goal. As an example, “I buy new soap before running out of soap” was judged as a good plan and “I buy soap when I run out of it” as a bad plan for preventing a lack of soap (action planning). Accordingly, “I borrow soap from my concubine” was judged as a good plan and “I clean the container with water only” as a bad plan to overcome hindrances for washing the container with soap and water (coping planning).

2.4. Data Analysis

Data were analyzed with IBM SPSS Statistics 21. First, a forced-entry regression analysis was computed to identify relevant contextual factors. Because of multicollinearity between religions, only Islam, as the most represented one, was included in the analysis. The variable for religion was thus dichotomous and indicated whether the respondent’s religion was Islam or not. For the same reason of multicollinearity between the use of a clay pot, a plastic container and a jerry can, the only type of storage container included in the regression analysis was the clay container. The variables for Christianity, animist religions, the use of a plastic container and the use of a jerry can are excluded from the regression analysis. The frequencies of the included and nonincluded variables are given in Table 1.

Second, a hierarchical regression with relevant contextual factors in a first step and sociopsychological factors in a second step was computed. For both forced-entry and hierarchical regression, assumptions of multicollinearity, homoscedasticity, independent, and normally distributed errors, as well as linearity, were met.

3. Results

3.1. Qualitative Observations

In the rural areas of Benin, there is normally no tap water provision at the household level. People collect their water at distant sources in the village and transport it back home, where they normally transfer it to a separate container for storage. Such containers typically are a heavy clay containers up to more than 50 L, with a wide opening. There are also plastic buckets of various sizes and jerry cans with a small opening. The location of water storage containers varies, and water might be stored both indoors and outdoors. Some households have a separate container for drinking water, whereas others use the same water for different purposes (e.g., taking a shower or washing the dishes).

3.2. Descriptive Analysis

In most of the cases, the person responsible for the management of drinking water in the household was female (98.7%) and aged between 15 and 89 years (see Table 1). Education was low: 13.6% could read and write. Concerning ethnicities, 39.9% of the sample were Yom; 19.6% Kotafon; 21.1% Lokpas; 8.1% Adja-Fons; and 11.3% of other ethnic backgrounds. Among religious affiliations, Islam was most highly represented, followed by Christianity and animist religions (see Table 1).

Among the population, 67.9% stored their drinking water in a clay pot; 23% stored it in a plastic bucket; 5.7% used a jerry can for water storage; and 3.4% used other types of containers. Drinking water is stored for a period of 1–3 days in 74.3% of the households. In some cases, it is stored for up to 30 days. For cleaning the containers, 72.8% of the respondents indicated using soap, and 77.2% reported to normally cleaning the container before refilling it with water. On average, respondents had a medium to strong habit of cleaning their drinking water storage container with soap and water (see Table 2). Several reasons for cleaning the container were mentioned by the respondents (e.g., to avoid diseases, to avoid drinking dirty water, or to remove the deposits at the bottom of the container). The mean frequency of drinking water treatment was between “never” and “seldom.”

Means and standard deviations of the sociopsychological factors are shown in Table 2. Except for instrumental beliefs regarding effort and forgetting, the means were higher than the mean value of the scale. Vulnerability was perceived as higher for the children than for the respondents themselves. For bipolar scales, all means were in the positive range of the scale. As for planning, about 20% more of the participants had a good action plan than a good coping plan.

3.3. Contextual Predictors of Habitual Cleaning

A linear regression analysis showed the type of storage container ($\beta = -0.25$) as the only significant habit predicting contextual factor (see Table 3). Participants using a clay container for drinking water storage in

Table 3. Forced-Entry Regression Analysis of Habitual Cleaning With Contextual Predictors

	<i>B</i>	<i>SE B</i>	β
Constant	0.74	0.09	
Length of water storage (days)	0.00	0.00	0.03
Number of persons living in the household	0.00	0.00	−0.03
Type of storage container (clay container)	−0.13	0.02	−0.25*
Volume of storage containers	0.00	0.00	0.05
Frequency of water treatment	0.02	0.04	0.02
Literacy	0.00	0.03	0.02
Household's socioeconomic status	0.08	0.06	0.07
Frequency of radio listening	0.01	0.04	0.01
Frequency of TV watching	0.03	0.05	0.03
Religion (Islam)	0.02	0.03	0.04
Age of respondent (years)	0.00	0.00	0.03
Coverage of stored water	−0.04	0.03	−0.06
Current availability of soap in the household	−0.01	0.08	−0.01

^aAdjusted $R^2 = .047$, * $p < .001$. B = unstandardized regression coefficient; $SE B$ = standard error of B ; β = standardized regression coefficient.

comparison to other kinds of containers showed a weaker habit of cleaning the storage container with soap and water. The model could explain only 4.7% of the variance.

3.4. Sociopsychological Predictors of Habitual Cleaning

A hierarchical regression for habitual cleaning was computed, including the type of storage container in a first step and the sociopsychological factors in a second step. The results showed that various sociopsychological factors significantly predicted habitual cleaning of the drinking water storage container with soap and water (see Table 4). The most important predictors were commitment ($\beta = 0.35$), forgetting ($\beta = -0.22$), and self-efficacy ($\beta = 0.14$). The higher people's commitment and perceived self-efficacy of cleaning their drinking water storage container with soap and water was, and the less they forgot to do it, the higher their habitual cleaning was. Further, high values in maintenance self-efficacy ($\beta = 0.08$), descriptive norm ($\beta = 0.06$), personal norm ($\beta = 0.06$), and perceived effort ($\beta = 0.06$) went along with stronger habitual cleaning. High perceived severity ($\beta = -0.07$), on the contrary, predicted lower habitual cleaning. The type of storage container also remained significant, although its β -value was medium ($\beta = -0.10$). The model

Table 4. Hierarchical Regression for Habitual Cleaning With Contextual and Sociopsychological Predictors^a

	<i>B</i>	<i>SE B</i>	β
<i>Step 1</i>			
Constant	0.79	0.01	
Type of storage container	−0.14	0.02	−0.26***
<i>Step 2</i>			
Constant	0.11	0.04	
Type of storage container	−0.05	0.01	−0.10***
Perceived vulnerability	0.00	0.02	0.00
Perceived severity	−0.07	0.03	−0.07**
Instrumental beliefs (response efficacy)	0.04	0.03	0.03
Instrumental beliefs (effort)	0.05	0.02	0.06*
Affective beliefs (cleaning)	0.04	0.03	0.04
Affective beliefs (taste)	0.03	0.02	0.05
Descriptive norm	0.06	0.02	0.06**
Injunctive norm	0.01	0.02	0.01
Personal norm	0.05	0.02	0.06*
Self-efficacy	0.18	0.04	0.14***
Maintenance self-efficacy	0.09	0.04	0.08*
Recovery self-efficacy	0.06	0.04	0.06
Action planning	0.02	0.01	0.04
Coping planning	−0.01	0.01	−0.01
Forgetting	−0.18	0.02	−0.22***
Commitment	0.41	0.03	0.35***

^aAdjusted $R^2 = 0.067$ for Step 1; adjusted $R^2 = 0.625$ for Step 2 ($p < 0.001$). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. B = unstandardized regression coefficient; $SE B$ = standard error of B ; β = standardized regression coefficient.

explained 62.5% of the habitual cleaning variance in comparison to the 6.7% explanation variance of the contextual factor alone.

4. Discussion

The aim of the study was to identify contextual and sociopsychological factors predicting habitual cleaning of household drinking water storage containers with soap and water. Based on those behavioral determinants, interventions can be designed to influence them accordingly.

4.1. Descriptive Analysis

Drinking water is stored 1–3 days in nearly three-fourths of the households, and, in other cases even longer. Therefore, the deposits at the inner side of the container mentioned by several respondents are not surprising, and they demonstrate the actual need for regular container cleaning. With almost 30% of the respondents normally not using soap for cleaning their containers and more than 25% having either no habit at all or at the most a medium habit of cleaning their drinking water containers with soap and water, the need for behavior change interventions fostering the cleaning of drinking water storage containers with soap is apparent. The fact that soap is available in almost all households indicates that the problem is not a matter of access to the needed product. As to other related hygiene behaviors, as much as 20% of the households did not cover the stored drinking water, and its treatment mean value did not exceed “seldom.”

4.2. Contextual and Sociopsychological Predictors of Habitual Cleaning

As for the contextual factors, only the type of container used to store drinking water could significantly predict habitual cleaning. People storing their drinking water in a clay container had a weaker habit of cleaning their storage container with soap and water than did people using other storage containers. Cleaning a clay container is a difficult task, as the container is heavy, and it cannot be tilted, and thus the soapy water has to be bailed out of the container. Alternative water storage containers were used, such as jerry cans or plastic buckets. The very small opening of jerry cans makes proper cleaning as difficult as it is with clay containers. However, only a few households used jerry cans for drinking water storage. Most of the respondents not using a clay container used a plastic bucket, which can easily be cleaned. Therefore, it seems evident that the type of storage container can predict habitual cleaning, which is stronger in households using a plastic bucket than it is in those using a clay container. In the course of testing for no multicollinearity as an assumption of regression analysis we checked for correlations between the possible predictors. Indeed, we found a low negative correlation of the use of a clay container with the perceived self-efficacy. Difficulties with the cleaning of clay containers have also been found by *Günther and Schipper* [2013]. However, they compared open-mouthed plastic containers to narrow-mouthed clay containers; therefore, the small opening of the container may be the main reason for their results. However, the contextual factor alone offers a weak explanation of variance (6.7%). Adding of the sociopsychological factors contributed essentially to the 62.5% explanation of variance. The most important predictors of a habitual cleaning were how much the respondent considered herself able to always clean her drinking water storage container with soap and water (self-efficacy), how strongly she felt committed to the task, and how often she forgot to do it. Evidently, the latter was negatively associated with habitual cleaning. If an intervention could increase a person's commitment to clean the storage container with soap and water by one unit out of five, e.g., from “it is not important for me” to “it is medium important,” the model predicts a strengthening of habitual cleaning by 1.5 units, e.g., from a “weak habit” to a “medium” to “strong habit.” A decrease of forgetting by one unit out of five predicts a strengthening of habitual cleaning by somewhat more than half of a unit. Finally, an increase of the perceived self-efficacy predicts a strengthening of habitual cleaning by somewhat more than half of a unit. Thus, an intervention tackling these three predictors could lead a person that has no habit in water storage container cleaning to develop a habit. Commitment has also been found to be a predictor of habitual latrine cleaning by *Sonego and Mosler* [2014]. Self-efficacy, as well, has been an important predictor of other habitual behaviors [*Inauen et al.*, 2013; *Sonego and Mosler*, 2014]. Further sociopsychological factors could predict significantly (although weakly) the behavior. High values in a person's perceived ability to deal with barriers in maintaining the cleaning with soap (maintenance self-efficacy), the more other people are perceived to do the same (descriptive norm),

and a high personal obligation to clean the storage vessel with soap and water (personal norm) as well as perceived effort (instrumental beliefs) went along with stronger habitual cleaning. Yet, why respondents who perceived the cleaning more effortful than others had a stronger habit of cleaning with soap and water has not been explained. One could suppose that there is a reverse effect, such that people with a strong habit of cleaning their container regularly know how effortful the task actually is. Perceiving the consequences of contracting diarrhea as severe, on the contrary, predicted lower habitual cleaning. Mosler and Kraemer [2012] found a similar result in Zimbabwe when they investigated different user types of solar water disinfection (SODIS) over time. When “tryers” (people who used SODIS occasionally) stayed tryers or developed into long-term users, their perceived severity of diarrhea decreased. The researchers explained these findings by the assumption that people using SODIS feel safer and thus perceive diarrhea as less severe. In this case, people would perceive themselves as less vulnerable to diarrhea. Interestingly, in the present study, perceived vulnerability did not predict habitual cleaning, although perceived severity did. Other studies in the water, sanitation, and hygiene (WASH) domain did not find the latter as a predictor of behavior, neither in a negative nor in a positive association [Huber *et al.*, 2014; Inauen *et al.*, 2013; Sonogo and Mosler, 2014]. Hence, the phenomenon needs further investigation.

4.3. Limitations of the Study

The present study investigated the factors underlying the habitual cleaning of drinking water storage containers with soap and water. The habitual cleaning of drinking water storage containers is a self-reported variable that can differ from observed behavior [John *et al.*, 2014]. In a future study, the former could be completed by observations to investigate the importance of the sociopsychological predictors not only for psychological variables but also for observed behavior.

Habitual cleaning was not linked to a specific moment when investigated. Therefore, it is not possible to say if a strong habit of cleaning the storage container refers to a cleaning behavior on, for instance, a daily or a weekly basis. Nevertheless, one can assume a cleaning once every 1–3 days, as 77.2% of the respondents stated that they clean their storage container before they refill it. In nearly three-fourths of the households, the container needed to be refilled within 3 days.

The present study is cross sectional, and thus further investigation is needed to draw causal conclusions about the predictors’ relation to the behavior.

4.4. Implications for Practice

Intervention strategies for enhancing the habitual cleaning of drinking water storage containers with soap and water should focus on influencing the three most important predictors of the behavior: commitment, forgetting, and self-efficacy. Mosler [2012] suggests the following behavior change techniques: First, a public commitment to cleaning the water storage container with soap and water would not only influence the commitment, but also the person’s personal and descriptive norms because the commitment would be seen by others. Second, preventing forgetting, or rather fostering remembering, can be accomplished by a reminder at the storage container. Each time one is about to refill the container, the person can be reminded of the need to clean it first. Third, self-efficacy can be targeted by using peers as role models. Further, people could be encouraged to store drinking water in a plastic container with a broad opening and a lid instead of a clay container. As the former is easier to clean, the self-efficacy would be strengthened. Nevertheless, the clay container’s advantage of keeping water cool should be considered [Günther and Schipper, 2013].

5. Conclusion

The present study considered both contextual and sociopsychological factors for explaining habitual behavior. The combination of factor types appeared to be beneficial for developing intervention strategies, as it provided additional clarification on the underlying factors of the behavior. Interventions to foster the habitual cleaning of household drinking water storage containers with soap and water should especially focus on commitment, self-efficacy, and forgetting, with consideration of the type of water container, which could hinder a habitual cleaning.

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