MASTER THESIS

INFLUENCING HYGIENIC BEHAVIOUR OF RECREATIONAL SWIMMERS

A FIELD EXPERIMENT ON THE EFFECT OF MINIMAL INTERVENTIONS ON PRE-SWIM SHOWERING IN SWIMMING POOLS

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ABSTRACT

This study aims to influence behaviour of recreational swimmers by minimal interventions, with the result that more bathers take a shower before swimming. First, a preliminary study was conducted to identify hygienic behaviour in swimming pools and to find reasons of recreational swimmers for (not) taking a shower. Second, three different interventions were designed and implemented, based on the preliminary study and literature, at three swimming pools. At those swimming pools, shower behaviour was observed of the recreational swimmers (N= 3188) before and after the implementation of the interventions. One intervention, based on information provision, had the desired effect: there was a significantly increase in pre-showering among recreational swimmers. Last, a final questionnaire was conducted at the same locations to find out if the recreational swimmers had noticed the interventions and how they evaluated them. Although the interventions were not seen by all subjects, the interventions were positively evaluated. It could be concluded that a minimal intervention can influence behaviour and future research could optimize this effect.

Keywords: influence behaviour, hygiene, interventions, swimming pool, pre-swim shower

INTRODUCTION

Being healthy and exercising are two important factors in human life. Swimming combines those two and is therefore a healthy activity to practice. Although swimming is a healthy activity, it can also have some unhealthy effects, due to pollution in the water (LaKind, Richardson, & Blount, 2010). There are several factors that can cause pollution in swimming pools, like sweat or urine (Keuten, Schets, Schijven, Verberk, & van Dijk, 2012; Keuten, Peters, Daanen, de Kreuk, Rietveld, & van Dijk, 2014). In line with research of Keuten et al. (2012, 2014) the mission of this study is to accomplish a reduction in this pollution in an attempt to make swimming pools an even healthier environment through minimal interventions, which are intended to reduce these unhealthy effects.

The question is where the pollution in swimming pool water comes from. Mostly, bathers themselves bring the pollution into the pool (Keuten et al., 2012). These pollutants are called anthropogenic pollutants and can be divided into three categories: initial, continual and incidental. Initial anthropogenic pollutant release is the easily rinsed off pollution from peoples' bodies: (old) sweat, dirt, make-up, etc. Continual anthropogenic pollutant release is produced when people sweat in the water, for example when they are exercising in the pool. The last type is the incidental anthropogenic pollution, consisting of human excreta like urine, poop and vomit (Keuten et al., 2012). Those three types of pollutants have a similar share in the total human pollution of swimming pool water; each about 30-40% (Keuten et al., 2014). Thus, 60-70 % of the pollution of swimming pool water is due to unhygienic behaviour (not taking a shower and/or not using the toilet).

The initial pollutants represent a significant part of the pollutants and could be reduced by removing it from people's bodies. It is easier to remove those initial pollutants than to avoid little accidents (incidental pollution) or to stop people from sweating (continual pollution) and therefore the focus of this research will be on the initial pollutants. A solution for decreasing initial pollutant release, is the increase of shower use before entering the swimming pool. During a 60 second pre-swim shower, all initial pollutants are removed, while in the first 30 seconds of showering already 75% of the initial pollutants are removed (Keuten et al., 2012). The personal hygiene of the bathers could therefore play a role in improving the water quality (Guida, Galle, Mattei, Anastasi, & Liguori, 2009). Based on the studies of Keuten et al. (2012, 2014) it is expected that recreational swimmers, who do not sweat as much as sport swimmers in the water, create an even higher percentage than 70% of pollution caused by unhygienic behaviour. Therefore, the focus of this study is on the

recreational swimmer.

Swimming pools are well aware of the water pollution and use chlorine based products for disinfection, to keep the pools clean and healthy. However, there are disadvantages connected to chlorine based pools. The biggest disadvantage is an adverse effect on the respiratory health of the pool visitors and the working staff (Nemery, Hoet, & Nowak, 2002). This is caused by unwanted side effects of the chlorination. The pollutants in the pool water react with chlorine and lead to the formation of disinfection by-products (DBPs). These DBPs not only cause possible respiratory health problems, they can also cause skin and eye irritation (Keuten, Schets, Schijven, Verberk, & van Dijk, 2012). Reduction of bather pollutants will reduce the DBPs and therefore decrease the adverse health effect of swimming pools.

To decrease this pollution, and thus reduce the use of chlorine in swimming pools, "the public mind set must be changed; swimmers may be open to modifying their behaviors once they become aware of the health risks associated with unhygienic practices." (LaKind, et al, 2010, p. 3208). The question thus becomes if awareness alone can change behaviour. How behaviour can be influenced in a way that people show the 'desired' behaviour, in this study: to take a pre-swim shower, will be discussed in the section 'Theoretical framework'. To reduce costs and efforts for all parties, the aim is to find a minimal intervention. Therefore, no coercion will be used, nothing will be re-build, only interventions that could be produced with low costs and efforts will be considered. Some examples of earlier studies towards influencing human behaviour by minimal interventions, which were used in the present study, are also discussed in that section. After discussing the outcomes of those examples, the preliminary study will be presented, to find an answer whether or not the outcomes of the examples are also applicable on the present study. The results of the preliminary study and the findings in the literature combined led to the main study and its interventions, which follows after the preliminary study.

THEORETICAL FRAMEWORK

Behavioural influence

Ninety-five percent of all human behaviour is automatic (Pol, Swankhuisen, & van Vendeloo, 2006). This means people do not think about most of their actions before actually performing them. Humans are exposed to all sorts of (persuasive) information all day long and the way that information is processed is an important factor for their behaviour. The information can be processed in two different ways: it can follow the central route or the peripheral route. The

central route will be followed when the subject is highly motivated by the target, for example when it is something personally interesting. The target also has to be capable to process the information; there should not be distractions (Petty & Cacioppo, 1986). Attitude is a predictor for planned behaviour when the central route is followed and could be influenced with arguments (Petty & Cacioppo, 1986). To illustrate: when a company aims to sell a product and sends information about it to a highly motivated person (that follows the central route), the company should use arguments to influence the behaviour (buying the product) of that person.

This is not the case when the peripheral route is followed. The peripheral route will be followed when a person is not motivated or does not have the ability to process the information. This means arguments should not be used in interventions when the peripheral route is followed. Pol et al. (2006) suggested that stimuli could attract the attention of people who follow the peripheral route (e.g. famous movie stars, creative messages and jokes). They also state that social influence should be used when the peripheral route is followed. According to Cialdini (2003), "people tend to do what is socially approved as well as what is popular" (p. 105) and "Norm-based persuasive communications are likely to have their best effects when communicators align descriptive" (contains perceptions of which behaviour is typically performed) "and injunctive" (contains perceptions of behaviours which are approved or disapproved) "normative messages to work in tandem" (p. 108). Thus, a persuasive message should both be norm based, and show what is socially approved to have a large effect (Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). This was also the principle of the study of Cialdini, Demaine, Sagarin, Barrett, Rhoads and Winter (2006). There, they found that a sign with a message containing injunctive normative information, is effective for influencing behaviour. Also, they found that a message containing descriptive normative information was most likely to show the undesired behaviour (especially when the message focused on the negative behaviour). This is somehow in contradiction with the study of Pol et al. (2006). They exposed people to a sign that contained a message that said as much as: so many persons did already do this. When people saw this sign, they were also more likely to show this behaviour because they wanted to be 'part' of the group and follow their example. It also works the other way around according to Pol et al. (2006): when a message shows bad behaviour of other people, it is more likely that this behaviour will be followed by others. This happens even when the message makes clear that the behaviour is bad. Pol et al. (2006) state that descriptive normative information can affect the behaviour in the desired way, if it focuses on that desirable behaviour and that is in contrast with what Cialdini et al. (2006)

said. The present study could use both examples to find out what works in the context of hygienic behaviour in swimming pools.

The studies of Cialdini et al. (2006) and Pol et al. (2006) were two examples of studies that experimented with signs that used persuasive communication to influence others behaviour. Such research has not been conducted yet in swimming pools, however it has been done in other fields, e.g. hand washing, recycling and safety management. Several studies from those fields will be used for examples and inspiration for the present study.

Behaviour influence in other fields

Johnson, Sholcosky, Gabello, Ragni and Ogonosky (2003) tried to increase the frequency of hand washing in public restrooms by using the sign 'please wash hands'. This message alone did increase hand washing by women, only not significantly by men (Johnson, Sholcosky, Gabello, Ragni and Ogonosky (2003). Therefore, Nichols (2014) used this study to design its own intervention for increasing hand washing and designed a sign that contained the message 'Washing your hands after going to the bathroom reduces your risk of catching or spreading infectious diseases such as salmonella or hepatitis A.' This sign was a reminder of the negative consequences of not washing hands. Such arguments are most likely to have good results, if the central route of information processing is followed (Petty & Cacioppo, 1986). Result of the study of Nichols (2014) was an increase in soap usage during hand washing, especially for men. However, there was no significant increase in washing hands itself. It looks like the sign of Nichols (2014) did have a positive effect, however not the desired effect: increase washing hands by everyone. To create that desired effect, the sign should be optimized. More examples of similar studies will be given that did create this desired effect. Also, Nichols (2014) found that the subjects reported (significantly) higher rates of hand washing than the rate that were observed, therefore these measures did not match.

Another example of an intervention for increasing the frequency of washing hands was a campaign in a hospital, studied by Pittet, Hugonnet, Harbarth, Mourouga, Sauvan, Touveneau and Perneger (2000). Their campaign consisted of several elements, like educational tools, reminders in the environment and feedback. Their most prominent component was a big poster that contained information about washing hands. This campaign did indeed increase hand washing and according to Pittet et al. (2000), the combination of all these components was the secret to their success.

Also Grant and Hofmann (2011) experimented with different signs, trying to increase

hand washing among health care professionals. One sign emphasized personal safety and the other sign patient safety. Result: the sign emphasizing patient safety did significantly increase hand washing among the health care professionals. Therefore, this could be used for the present study. A note should be made for the present research, because there exists no doctor/patient relationship. Recreational swimmers do not have to take care of other bathers and therefore these signs could have a different outcome when used in swimming pools. This should be taken into account when designing interventions for the present study.

The former described interventions were in a similar field of the one in the present study (hygiene), however they did not use (social) norm based interventions. There are other fields where they did use these (social) norm based interventions, like the recycle field. Schultz, Khazian and Zaleski (2008) conducted three experiments in hotels with normative messages. They found the same result as Cialdini (2003): normative messages can change people's behaviour and this has the best effect when it is combined with descriptive and injunctive elements. Schultz et al. (2008) posted printed normative messages in hotels and tried to increase the reuse of towels by hotel guests. This succeeded: the number of replaced towels decreased with 25%, thus the reuse of towels increased. Another study in this same field shows the same effect: when adding a descriptive norm to a message (in this case: most guests reuse their towels), it has a significantly better effect than when it only focuses on the good behaviour/ the goal (Goldstein, Cialdini, & Griskevicius, 2008).

The last examples of studies which used (social) norm based interventions that will be discussed, are in the field of safety management. Pol and Swankhuisen (2013) also tried to influence behaviour, more specifically the behaviour of students, to improve their safety environment. Their goal was to increase the use of smoke detectors among students. They placed a sign with the message: "Most students make sure they have a well working smoke detector. That is safer for you and for your roommates." The two signs of Grant and Hofmann (2011) are somehow combined in this study of Pol and Swankhuisen (2013). This intervention is more likely to have a good result if the peripheral route is followed, because it contains no arguments (Petty & Cacioppo, 1986). For the design of the interventions for the present study, it is essential to know which of the two routes is followed considering information about showering before swimming and this should therefore be further examined.

The final research example comes from Kretzer and Larson (1998). They give a few recommendations for theoretically based interventions, e.g. in the field of safety management.

One recommendation is: “Incorporate into interventions the constructs that have been shown consistently to be predictors of behaviour or to have strong influence on behavior. These include beliefs, perceived health threat, cues, self-efficacy, attitude, subjective norms, perceived behavioral control, intention, and stages of changes.” (Kretzer & Larson, 1998, p. 252). This recommendation could be used in the present study, because it exists of elements like norms and changes that are also used in all the other discussed fields. Therefore, it seems like these elements are somehow generalizable.

In conclusion, the components of a good intervention that can influence behaviour are clear: a) a different strategy for central and peripheral route; b) norms; c) naming the appropriate behaviour; d) combination of different persuasive elements and e) the effect of showing the right behaviour. However, some of these components are still unknown for the present study, because no such research has been conducted yet in the field of swimming pools. For example: which route is followed by recreational swimmers with regards to information in swimming pools? Also: do the recreational swimmers know what the appropriate behaviour is? Therefore, a preliminary study was conducted to answer these questions and those answers were used for the design of the interventions in the main study. The preliminary study had one more goal: describe the behaviour of recreational swimmers in the Netherlands. As said before, studies towards influencing behaviour are not (yet) conducted in swimming pools. However, there is one study in this field that tried to describe behaviour of bathers and their knowledge about pool hygienic (in Italy). This study reported that 70.9% of the bathers take a shower before entering the pool (Pasquarella et al., 2014). Also, 41.7% of the participants had never read the swimming pools rules and there was a significant relationship between not reading the house rules and not showering before entering the pool (Pasquarella et al., 2014). Also, more men than women reported to take a shower before entering the pool. A note should be made, because these results were based on the answers given by the bathers (self-report) and were not observed. In the study of Nichols (2014) could be concluded that the self-reported answers regarding hand washing were higher than the observed ones. This could also be the case in the present study. Therefore, the present study will compare the results of this Italian study with the situation in the Netherlands, by asking the same kind of questions used in the Italian research and to verify them with observations.

PRELIMINARY STUDY

Goal of the preliminary study was to find which components could be used for the interventions of the main study. Therefore the following question was formulated: what are the reasons of recreational swimmers for not taking a shower before they enter a pool? Also, the preliminary study aimed to find whether the central or peripheral route was followed. A questionnaire was used to find possible differences and similarities in the behaviour of bathers in the Netherlands, compared to the behaviour of the bathers reported in the study of Pasquarella et al. (2014) and their knowledge about hygiene in pools.

Participants

A questionnaire was administered at two swimming pools (1 and 2; n = 51, M_{age} = 38.94 SD_{age} = 13.82). The subjects were all adults, as parental permission is required for minors to participate in a questionnaire and minors are not always accompanied by an adult at a swimming pool. Minors are regular visitors of swimming pools: of the people between 6-19 years, 61% swims at least once a year. In the age group 20-64 years, this is 32% and in the age group 65-79 years this is 12% (Van der Werff, Van Bedaf, Hoenderkamp, & Breedveld, 2012). To include this group in the study, the questionnaire was also conducted at a soccer club, where the parents were informed about the questionnaire before it was handed out. They received an e-mail with information about the questionnaire, which included the option to not give their child permission to participate. Two teams, a girls and a boys team, (n = 18, M_{age} = 14.06, SD_{age} = .8) participated in the questionnaire.

Materials

The questionnaire consisted of questions like: should people, in general, take a shower before entering the pool? and what kind of beauty products did you use this day? The entire questionnaire can be found in appendix A. For the two swimming pools and the soccer club, the questionnaires were identical and consisted of 17 questions. They only differed in wording (e.g. ‘did you take a shower before entering the pool?’ instead of ‘do you take a shower before entering a pool?’). Four questions were closed items and the rest of the questions were open or several options could be ticked. The following information was asked in the questionnaires: 1) demographics; 2) persons they came with to the pool; 3) frequency of the pool visits; 4) reason for the pool visit; 5) familiarity with the house rules, 6) pre-swim showering behaviour of themselves and reasoning; 7) attitude pre-swim showering in general and 8) use of personal care products.

Procedure

Participants at the swimming pool were asked to participate when they walked by the shower area or when they sat at the side of the pool. The researcher asked the questions and wrote the answers down, for the simple reason that most of the participants were wet. At the soccer club, participants all sat separately in the canteen and filled in the questionnaire by themselves.

Scoring and Data-analysis

All the questionnaires were filled in hard copy and were analysed afterwards with the statistical analysing software SPSS. The open questions were quantified. First, every given answer was listed. Second, the researcher looked if there were similar answers. Those were combined, analysed with SPSS and every answer represented a different variable. Descriptives in SPSS were used to obtain the percentages of all answered questions. Third, comparisons between groups were made. Significant results were used to identify differences between groups (like age groups, sex, location and their shower behaviour). This was also analysed with SPSS, by the use of the Chi-square test. An alpha level of .05 was used to determine the significance level for all statistical tests.

Results and discussion

As shown in Table 1, the largest respondents group (37.7%) went to a swimming pool weekly.

Table 1

Frequency Pool Visits

	Frequency pool visits (%)
Daily	2.9
4 times a week	2.9
3 times a week	2.9
2 times a week	2.9
Weekly	37.7
3 times a month	4.3
2 times a month	1.4
Monthly	5.8
6 till 11 times a year	15.9
2 till 5 times a year	11.6
Annually	10.1
Less than once a year	1.4

Almost half of the subjects (49.3%) went to the swimming pool for recreational swimming, followed by 46.4% of the subjects that went for lap swimming and a small percentage (4.3%)

went to the pool for sports (e.g. water aerobics or speed swimming). More than half of the subjects were not familiar with the house rules of the respective swimming pools (60.9%), which is a higher rate than the finding of Pasquarella et al. (2014). In their study, 41.7% of the respondents reported that they did not know the swimming pool rules. Furthermore, 46.4% believed that bathers could not become ill from the water in swimming pools. To get an overview of what kind of pollutants the subjects could also bring to the pool (besides e.g. sweat), a question was added to the questionnaire about the personal care products the subjects used the day of the pool visit. Only 14.5% of the subjects did not use any hygiene/ make-up products. Most used products were deodorant (76.8%), perfume/aftershave (39.1%), crème and make-up (both 26.1%).

Showering before swimming

Of the participants, 63.8% said they took, or generally take, a shower before entering the pool. This is close to the number of bathers (70.9%) that said they took a pre-swim shower, in the study of Pasquarella et al. (2014). The main reason for a pre-swim shower, given in the preliminary study, was hygiene (34.8%). That is a good thing, because it is a goal of this research: increasing the hygiene in swimming pools. Another frequently given reason for not taking a pre-swim shower, was 'because it is mandatory' (21.7%). Subjects could mention more than one reason. Several reasons were given for not taking a pre-swim shower, however not one was very outstanding. Still, the main reasons were: the subjects were in a hurry to take a swim (10.1%), the water of the showers was too cold (8.7%), and no specific reason (7.2%)

When taking a pre-swim shower, 65.9% of the subjects rinsed their whole body while showering and most subjects said they wetted their hair (77.3%). Only 2.9% used shampoo and a 1.4% of the subjects said they used soap. The duration of showering is mostly between ten seconds and one minute, estimated by the subjects. Of the subjects, 75.4% believed people should take a shower before entering the pool in general, mostly for hygienic reasons (56.5%). The reason most often given by respondents for not believing that people need to take a shower before swimming was: I do not know (35.3%). The ignorance/indifference of the recreational swimmer is showing between the lines and it seems like the bathers do not actually consider to shower before entering the pool, they just do not take a pre-swim shower. This is a typical example of automatic behaviour: bathers do not think about taking a pre-swim shower and this should be kept in mind when trying to influence the behaviour regarding the pre-swim showering.

When subjects were accompanied by other persons that did take a shower, they were

more likely to take a pre-swim shower themselves: $\chi 2(4, n = 69) = 26.97$, $p < .01$. This was also the other way around: when they came with persons that did not take a shower, they were less likely to take a pre-swim shower themselves. It seems that social influence plays a role in deciding whether to take a shower or not. This was taken into account when designing the interventions. Another finding of the questionnaire was that the subjects were more likely to take a pre-swim shower if they believed other people should take a shower in general: $\chi 2(1, n = 69) = 7.92$, $p < .01$.

Differences between groups

There were several differences in the results of the questionnaires between the different groups. The respondents at the two swimming pools were seen as one group and the respondents of the soccer club as a second group, because it was expected to find several differences between adults (subjects of the two swimming pools) and minors (subjects of the soccer club). The shower duration showed a difference between the two groups: subjects at the soccer club indicated to take shorter pre-swim showers than subjects in both swimming pools, $\chi 2(8, n = 69) = 16.43$, $p < .05$. The largest group was found in the one to ten seconds showering group, among the subjects at the soccer club (60%). The largest group at the swimming pool could be found in the 10 seconds to one minute group (47.1%).

More subjects at the soccer club indicated that the persons they came with did not take a shower, or they were not aware of what those other persons did, compared to the subjects in the swimming pools, $\chi 2(2, n = 69) = 19.19$, $p < .01$. The minors at the soccer club swam mostly recreational and less often than the subjects at the two swimming pools.

Preliminary study combined with literature

With the help of the already described literature and the results of the preliminary study, several guidelines were provided for the interventions that were used in the main study. The preliminary study indicated that the behaviour of the recreational swimmers was automatic, which suggests the peripheral route is followed (Pol et al., 2006). This was taken into account for the design of the interventions, which are described in the next section. Moreover, norm-based interventions could influence behaviour, with descriptive and injunctive elements (Pol et al, 2006; Cialdini, 2003; Cialdini et al, 2006; Goldstein et al., 2008 and Schultz et al., 2008). Also, social influence could guide the behaviour in the way that is desired (Pol et al., 2006). A combination of different components in interventions was also recommended from the literature (Kretzer & Larson, 1998; Pittet et al., 2000). Furthermore, the effect of the

behaviour should be clear (Grant et al., 2011). All these considerations were incorporated in the three interventions and described next.

Interventions

The first intervention was based on the study of Johnson et al. (2003), where they used a sign with a simple instruction and the peripheral route. Although the preliminary study did not provide a decisive answer on the question which route (central or peripheral) was followed, it suggested that bathers process information in the swimming pool automatically. Therefore, this intervention was based on the principal of automatic behaviour, which meant that no arguments should be used. For that reason, simple instructions were placed on signs. However, according to Nichols (2014), that is not enough to have a big effect on influencing behaviour. Pol et al. (2006) suggested that stimuli could attract the attention of people who follow the peripheral route. Therefore, a game element was added to the signs as a stimulus to attract the attention of the recreational swimmers.

The second intervention was an intervention with information that should be processed centrally, because the preliminary study did not provide a decisive answer which route to follow. Arguments have a significant impact on the central route (Petty & Cacioppo, 1986). Again, a principle of the sign designed by Nichols (2014), with the reminder of the negative effect of not showing the right hygienic behaviour, was used for the second intervention. In the study of Grant and Hofmann (2011), the negative consequences for patients affected the hand washing behaviour of health care professionals. In the present study, it was expected that such a relationship did not exist among the recreational swimmers. Therefore, the negative consequences for the recreational swimmers themselves were clarified in a sign and also how they could avoid these consequences.

The focus of the third intervention was, just like the first intervention, on the peripheral route, based on the outcomes of the preliminary study. This intervention was designed after the example of Pol and Swankhuisen (2013). In their intervention, the two signs of Grant and Hofmann (2011) were combined, because the consequences for the other persons as for the subjects themselves were clarified. However, the sign of Pol and Swankhuisen (2013) showed also a norm (i.e. which behaviour was shown mostly by the public). This norm principle was also incorporated in the third intervention.

Design and place interventions

According to Pittet et al. (2000), the combination of all different components was the secret to

their success. Such a design is not possible in the present study, because of the costs and because subjects are only staying temporarily in the pool. For example, Pittet et al. (2000) used educational tools, feedback and reminders in the environment for their interventions. The recreational swimmers had only one moment to perform the desirable behaviour: when they walked by the showers before they entered the pool. Therefore, feedback or reminders would not work in the present study. Educational tools were also not an option for the interventions, because there was no time to educate the pool visitors. Hence, only the most prominent component in the study of Pittet et al. (2000), the big poster, was used in the present study. This component is not expensive and easy to place. However, swimming pools have a humid environment, which can cause problems with paper posters. For that reason, stickers were used to function as posters, because the stickers would not be damaged if they got wet.

For the best possible effect of an intervention, it is important that the intervention is placed as close as possible to the location where the behaviour has to be shown, otherwise people tend to forget the message (Cialdini, 2003). Therefore, the showers were the ideal location for the intervention in this study. By placing the stickers directly at the showers, there is little or no time between the exposure to the message and the moment subjects actually display the behaviour. The placement height of the intervention was difficult, because of the determination of the best exposure rate for recreational swimmers. According to Erren and Bourne (2007), one important rule for placing a poster/sign is that it is readable at eye-level. However, swimming pools have a big target group, like kids and elderly, (e.g. kids and elderly), who all have different heights. Furthermore, the shower areas at the three locations were open rooms where the sign could not be placed in a good visible spot on the wall. For that reason, the signs were made into stickers that were placed on the floor. The eye-level problem was tackled by this, because no matter what height your are, the floor can be seen by every good sighted person and this floor spot was also very visible. Of course, it could occur that the recreational swimmers just walked over the signs without noticing them. The use of striking and contrasting colours increased the chance of noticing (Dogu & Erkip, 2000). According to Murch (1984) blue and yellow are striking colours that draw attention of people. These colours were used because they stand out from the predominantly white floors at the swimming pools. Next, an easy-to-read font was chosen. Arial is an easy-to-read font, because it is clear and it makes it easier for persons to process the instructions/information (Matthews, 2011). Last, the dimensions of the signs were large (30x50 cm), to optimize the visibility.

MAIN STUDY

The goal of the main study was to measure the effect of the interventions, with the objective that more bathers take a shower before swimming. Those interventions were based on previous research examples and the results of the preliminary study. Also, the results regarding the hygienic behaviour of recreational swimmers of the preliminary study and the study of Pasquarella et al. (2014) were compared and validated. The last objective of this main study was to find out (by a post questionnaire) if the interventions were seen and what the subjects' opinion of the interventions was. Hence, the research questions of this study were:

- To what extent can minimal interventions influence the pre-swim shower behaviour of recreational swimmers?
- How do recreational swimmers evaluate the interventions?

To get a reasonable sample size and at the same time minimize the travel expenses and staying within the budget, the research was conducted at three different locations in the eastern part of the Netherlands: A) pool in the city of Enschede, B) pool in the city of Hengelo and C) = pool in the city of Arnhem). At every location, a different intervention was conducted. Those three swimming pools were similar. They were all large pool facilities with multiple pool basins; they stood in eastern provinces in the Netherlands with almost the same number of citizens per swimming pool: just over 8.000 citizens in the province of location C, and also just over 8.000 citizens in the province of location A and B (van der Werff et al., 2012).

A baseline measurement, before the intervention was implemented, was conducted to give an overview of the current situation regarding pre-swim shower frequency. A post measurement, after the implementation of the interventions, had to give a decisive answer to what extent the interventions were effective: did the pre-swim showering frequency increase? At last, a post questionnaire was conducted among the recreational swimmers after the interventions, to acquire an evaluation of the interventions.

Participants

The main study was conducted at the three different swimming pools. A total of 3188 participants were observed during the main study, during the baseline measurement and the post measurement together. A total of 993 participants were observed at intervention 'routing game', 1193 subjects were observed at intervention 'information' and 1002 participants were

at intervention ‘social norm’. All participants were observed unknowingly, in order to let them conduct their normal behaviour.

For the post questionnaire, a total of 22 persons (M_{age} = 33.78, SD_{age} = 12.79) participated at location A, with the intervention ‘routing game’. At location B, with intervention ‘information’ it were 29 persons (M_{age} = 39.9, SD_{age} = 8.07) that participated and 11 persons participated (M_{age} = 33.09, SD_{age} = 6.64) at location C, with intervention ‘social norm’. All participants were above the age of 18. No minors were included, because they do not always visit swimming pool with their parents and parental permission was necessary for minors to participate in the questionnaire.

Materials

Interventions

Intervention ‘routing game’

As mentioned before in the preliminary study, the first intervention was based on a simple instruction, with a game element added to it. Figure 1 shows the signs. When the subjects entered swimming pool A, they saw a first sign at the cash register with the message: 1. Start, Buy a ticket. After that, several footsteps led the visitors to the second sign at the dressing rooms. The message of this second sign was: 2. Get changed. Further footsteps led the visitors from the dressing rooms to the third sign at the shower: 3. Take a shower. After the shower, footsteps accompanied the participants to the final sign at the entrance of the pool hall with the message: 4. Have a nice swim. The footsteps of this intervention were approximately 23x10 cm.

Figure 1. Intervention 'routing game'.

Intervention 'information'

Figure 2 shows the second intervention, which is a sign that contained icons with the message: no irritated eyes? Then take a shower before swimming! These were triggers to catch the attention of the recreational swimmers. The triggers had to make them read the arguments and explanation for the need for a pre-swim shower, which stood below. This intervention was placed at swimming pool B.

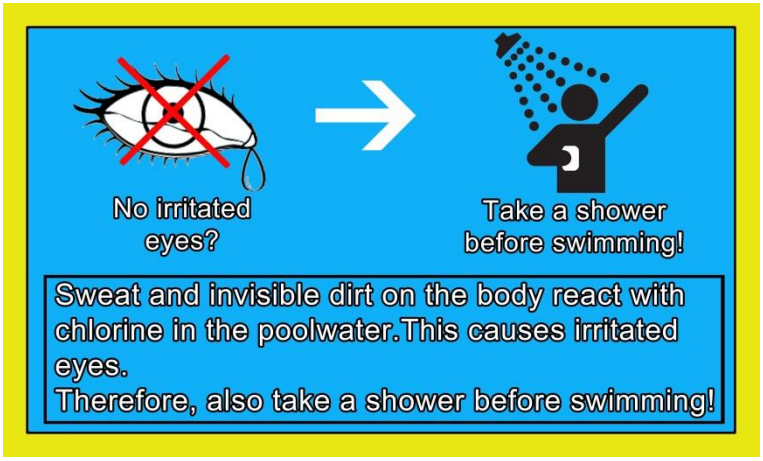

Figure 2. Intervention 'information'.

Intervention 'social norm'

The third and last intervention was norm-based, as described in the preliminary study. As can be seen in figure 3, this intervention was a sign with the message: "Most swimmers also take a shower before swimming. This is cleaner for you and for the other swimmers." This intervention was placed at swimming pool C.

Figure 3. Intervention 'social norm'.

Observation list

The researcher had a printed list, divided into five columns. These columns were labelled: 1) showered or not, 2) age (estimated by the researcher), 3) hair wetted, 4) shower duration and 5) belongings. Hair wetted and shower duration were observed to get a view of the hygienic behaviour of the subjects. For fast processing, a plus (yes) or minus (no) sufficed in most columns. The researcher also marked accompanying subjects. Shower duration at the location of intervention 'information' could not be taken into account, since the researcher did not

have a clear line of sight towards the showers. The observation spot could not be changed in order to obtain that clear sight, because that would make the observer very noticeable by the recreational swimmers and this could influence their behaviour. The observation list was the same for both the baseline measurement and the post measurement.

Post questionnaire

A post questionnaire was conducted among the participants. Examples of questions were: did you see the sign on the floor? and what do you think the goal of the sign was? Goal of this was to get an overview whether the participants noticed the interventions, if they did something with it and what their opinion about it was. Furthermore, the same questions about hygienic behaviour in the questionnaire of the preliminary study were asked. Again, this was to get a clear image of this behaviour and to compare it with the results of Pasquarella et al. (2014).

Procedure

Baseline and post measurement

The baseline measurement was conducted at every swimming pool for three observation days. At two weekdays and one weekend day per location, recreational swimmers were observed. At the location of intervention 'routing game' (n = 727), the researcher sat across the showers in bathing clothes. At the location of intervention 'information' (n = 665), the researcher sat at the live guard post. This was a cubicle of glass, from which the showers themselves were not visible. Nevertheless, it was visible whether or not the subjects walked into the showers and/or came out wet. At the location of intervention 'social norm' (n = 556), the researcher sat behind video screens to observe the subjects during showering with the use of shower facing cameras.

The researcher tried to keep as unobserved as possible. When participants did notice the researcher and asked what she was doing, the researcher answered that it was for research purposes and did not mention the aim of the study.

After the baseline measurement, the interventions were implemented and then the post measurement began. This measurement was almost similar to the baseline measurement. The only difference was in days, because of scheduling problems. For example, it could occur that the baseline study was conducted at location A on a Tuesday, Wednesday and Saturday, and the post measurement on a Wednesday, Friday and Saturday. It was expected that this had no

effect on the results. The same procedures at the baseline study were followed during the post measurement. During the post measurement of intervention 'routing game', a total of 266 subjects participated. With intervention 'information', this was n = 528 and with intervention 'social norm' this was n = 446. To validate the observations, another researcher joined the observations at one day during the post measurement. Both researchers had an observation list and after several subjects, the results written down in the columns were compared to each other. This was done for one entire observation and the results matched: both researchers filled in (approximately) the same results. The only difference between the researchers was found in the age groups, however still 83.2% of the filled in age groups did correspond. The other 16.8% differed at most 10 years, so one age group (e.g. researcher 1 filled in that a subject was between 31-40 years old and researcher 2 filled in that the subject was between 41-50 years old).

Post questionnaire

At the same days the post intervention observations were done, the post questionnaires were conducted at the swimming pools. Pool visitors were asked to participate while they were still present in the pool hall. The same procedures were followed as those in the preliminary study, the researcher interviewed the participants and their answers were written down by the researcher. The interview was held at a place where the subjects could not see the intervention signs.

Scoring and Data-analysis

Baseline and post measurement

The results of the observations were analysed with SPSS. Descriptive Statistics was used for the analyses. When only percentages were desired as an outcome, Frequencies were used. Crosstabs (Chi-square) was used for the other outcomes. When there was a significant result, the effect size was also a desired outcome. This was calculated with Phi and Cramer's V.

Post questionnaire

All the questionnaires were filled in hard copy and afterwards analysed with SPSS. Those open questions were quantified. First, every given answer was listed. Second, the researcher combined similar answers. These were combined and those were analysed with SPSS, every answer as a different variable. Descriptives were used to gain percentages of every answer. Significant results were searched to identify differences between groups (like age groups, sex,

location and their shower behaviour). This was also calculated with Chi-square. An alpha level of .05 was used for all statistical tests.

Results and discussion

Baseline and post measurement

Table 2 shows the percentages of subjects that were observed while taking a shower before and after the interventions. The intervention 'routing game' at location A did not have an effect: even less subjects took a shower, $\chi 2(1, n = 993) = .08$, $p = .42$.

At intervention 'information', the percentage of recreational swimmers who took a shower rose from 23.5% to 28% and this effect was significant: $\chi 2(1, n = 1192) = 3.24$, $p < .05$, however the effect size was low: Phi = .052. With intervention 'social norm', no significant effect was found: $\chi 2(1, n = 1002) = .56$, $p = .247$.

Table 2
Percentage of participants that did take a shower before swimming

Intervention	Before intervention (%)	After intervention (%)
Routing game	25.3	24.4
Information	23.5*	28*
Social norm	55	57.4

* $p < .05$

Effect interventions in groups

More variables were measured in this study, like age, sex, and accompanying recreational swimmers. Analysis showed if there were differences between those groups, like the sex difference that occurred in hand washing in the study of Nichols (2014). Table 3 shows those other variables and if there was a difference in showering before and after the intervention. As can be seen in Table 3, it seems that men are more susceptible for the interventions than women. This was only a significant effect for intervention 'information': $\chi 2(1, n = 614) = 3.19$, $p = .05$, Phi = .07, which is a low score.

Table 3
Variables differences in showering before and after interventions

Variable	Intervention 'routing game'		Intervention 'information'		Intervention 'social norm'	
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)
Sex						
Men	27.2	31.4	27.9*	34.9*	59.9	64.8
Women	23.5	18.9	18.6	21.4	49.6	47
Age						
0-10 (n= 1075)	23.3	14.3	18.7	18.6	48.7	55.2
11-20 (n= 657)	18	19.1	20	19.2	44	43.1
21-30 (n= 471)	30.3	30.6	25*	51.8*	54.4	64.8
31-40 (n= 526)	28.6	34.4	29.5	40.2	69.2	70.5
41-50 (n= 269)	33.9	40	24.3*	42.4*	57.1	70
51-60 (n= 138)	33.3	31.2	25	22.6	75[1]	100[1]
61-70 (n= 46)	71.4[1]	100[1]	29.6	50	100[1]	-[1]
71-80 (n= 5)	-[1]	-[1]	50[1]	-[1]	-[1]	-[1]
People subjects came with						
Alone	30	33.3	28.2*	42.1*	61.3	59.5
1 other person	21.5*	32.5*	21*	35.3*	58.9	57.1
> 1 person	26.4	14.8*	22.7	16.4*	49.6	56.9

[1]*:* The age groups 61-70 and 71-80 were very small at intervention 'routing game', respectively n= 6 and n= 0. At intervention 'information', age group 71-80 was very small, n= 3. At intervention 'social norm', age groups 51-60, 61-70 and 71-80 were very small, respectively n= 7, n= 5 and n= 0. So these should not be taken into account.
* $p < .05$

There were two age groups at intervention 'information' were the subjects showered significantly more after the intervention than before. This was age group 21-30 years, $\chi 2(1, n = 128) = 9.73$, $p < .01$, Phi = .28 and age group 41-50 years, $\chi 2(1, n = 107) = 3.57$, $p = .05$, Phi = .183.

Significant differences were also found between categories that differed in the number of persons with whom a swimmer entered the swimming area. For intervention 'routing

game', recreational swimmers that came with one other person showered more after the implementation of the intervention, $\chi 2(1, n = 305) = 4.53$, p = <.05, Phi = .122. Another finding was that swimmers who came with more than one person, showered less after the intervention, $\chi 2(1, n = 618) = 7.27$, $p < .05$, Phi = -.108. For intervention 'information', subjects that came alone, $\chi 2(1, n = 277) = 5.77$, $p < .05$, Phi = .144 and subjects who came with one other person, $\chi 2(1, n = 389) = 9.86$, $p <.05$, Phi = .159 showered more after the intervention. The same finding of intervention 'routing game' occurred during intervention 'information': subjects that came with more than one person showered less after the intervention, $\chi 2(1, n = 526) = 3.28$, $p < .05$, Phi = -.08. This result did not occur at intervention 'social norm'.

Overall results; differences per group

Table 4 provides an overall view of some variables. There seems to be several differences in groups and whether they took a shower or not. Also, the moment of the day could have an effect on showering. All data was combined per location because e.g. the variables sex, carrying belonging, moment of the day were not influenced by the interventions.

Table 4

Percentages of recreational swimmers that took a pre-swim shower

Variable	Location A (intervention 'routing game') (%)	Location B (intervention 'information') (%)	Location C (intervention 'social norm') (%)
Sex			
Men	28.2*	30.8*	62.4*
Women	22.2*	19.9*	48.6*
Carrying belongings			
Yes	16.9*	20.9*	37.8*
No	31.9*	31.3*	62.7*
Moment of day			
Morning/ afternoon	23*	24.2	53*
Evening	36.3*	28.9	62.6*
People subjects came with			
Alone	31.4	33.9*	61.1
1 other person	25.6	27.2*	58.1
> 1 person	24.1	19.8*	52.8
Wetted hair (of persons that showered)			
Did wet hair	88.4	86.2	91.3

*: $p < .05$

At every location, more men than women showered before entering the pool. For location A (intervention 'routing game'), this was: $\chi2(1, n = 993) = 4.77$, $p < .05$, Phi = -.07, for location B (intervention 'information'): $\chi2(1, n = 1193) = 18.71$, $p < .01$, Phi = -.13 and for location C (intervention 'social norm'): $\chi2(1, n = 1002) = 19.27$, $p < .01$, Phi= -.139. However, the effect sizes are small for all locations.

Also, a significant result was found regarding the subjects that carried belongings (e.g. a cell phone, towel or bag). At every location, a significant number of recreational swimmers showered less when carrying belongings. For location A (intervention 'routing game'), this was: $\chi2(1, n = 993) = 29.75$, $p < .01$, Phi= -.173, for location B (intervention 'information'): $\chi2(1, n = 1191) = 16.73$, $p < .01$, Phi = -.119 and for location C (intervention 'social norm'): $\chi2(1, n = 1002) = 48.8$, $p < .01$, Phi = -.221.

The number of subjects that showered before entering the pool was higher during evenings

compared with mornings/afternoons. However, this was only a significant effect for location A (intervention 'routing game'), $\chi 2(1, n = 993) = 12.52$, $p < .01$, Phi = .112 and for location C (intervention 'social norm'), $\chi 2(1, n = 1002) = 8.30$, $p < .01$, Phi = .091. Also, the effect sizes are small here.

When looking at accompanying persons, Table 4 suggests that when bathers came in groups, they were less likely to take a pre-swim shower. This result was only significant at location B (intervention 'information'): $\chi 2(2, n = 1192) = 20.08$, $p < .01$, Phi = .130.

Then, two other variables described the behaviour in the showers: hair wetted and shower duration (note: shower duration was not observed at location B (intervention 'information') and therefore not being taken into account). The majority of subjects that took a shower also wetted their hair, up to 91.3% at location C (intervention 'social norm'). As already mentioned before, hair contains several pollutants which can be (partly) rinsed off during a shower (Keuten et al., 2012). 83% of the subjects at location A (intervention 'routing game') had a pre-swim shower duration less than 30 seconds. At location C (intervention 'social norm'), this was 71%. This is not enough to wash all the pollutants off, because a shower duration of 30 seconds washes of 75% of the pollutants from peoples bodies (Keuten et al., 2012).

Post questionnaire

The post questionnaire had two objectives: finding out whether the recreational swimmers noticed the interventions and how they evaluated them. Of the respondents at intervention 'routing game', 63.6% said they did see the intervention. This was 31% at intervention 'information' and 45.5% at intervention 'social norm'. Thus, intervention 'information' was seen the least of the three interventions. However, this intervention had the best effect: significantly more recreational swimmers took a pre-swim shower after the implementation of this intervention.

The percentages of respondents of this questionnaire that said they had taken a pre-swim shower differed, this was 63.3%, 27.6% and 72.2% for the interventions 'routing game', 'information' and 'social norm', respectively.

Of the respondents at intervention 'routing game', 54.5% that did see the intervention, did not act like the message of the intervention, compared to 13.8% at intervention 'information' and 29% of the respondents at intervention 'social norm'. One reason was given the most for this at every location: the subjects just did not know why they did not act like the message of the intervention. Of the respondents at intervention 'routing game', 27.3% believed this

intervention was about giving directions/routing. Hygiene was one of the most given (10.3%) reasons at intervention 'information' when asking what the goal of the intervention was. Take a shower before swimming was the most (27.3%) given reason at intervention 'social norm' for that same question.

When asking what the opinion of the respondents was of the intervention, various answers were given. Especially at intervention 'routing game', the opinions differed a lot, from 'not that much' (9.1%) to 'cheerful (9.1%)'. Most given opinion at intervention 'information' (17.2%) and 'social norm' (27.3%) was 'good'. It seemed that the subjects that did see the interventions, were positive about them.

Conclusion

The first research question for the main study was: to what extent can minimal interventions influence the pre-swim shower behaviour of recreational swimmers? According to the results, this behaviour can be slightly influenced by the intervention that is based on information provision. The interventions based on simple directions in a game setting and based on norms, did not have the desired effect.

The second research question was: how do recreational swimmers evaluate the interventions? Overall, the subjects were positive about the interventions. However, not every subject did see them and when they saw them, they did not always knew what the goal of the interventions was.

Furthermore, the results of the Italian study of Pasquarella et al. (2014) were quite similar to the preliminary study, although both did not match the observations. There consisted several discrepancies between observation and the answers given at the post questionnaire. For example: the number of subjects that said they took a pre-swim shower (in the post questionnaire) compared to the actual observations of subjects that took a shower. This difference was the biggest at intervention 'routing game', where 63.3% of the recreational swimmers said to take a pre-swim shower, against 25.3% and 24.4% (baseline measurement and post measurement respectively) during the actual observations. At intervention 'social norm' 72.2% of the subjects said, during the post questionnaire, they had taken a pre-swim shower, against 55% and 57.4% during the baseline and post measurement of the observations. There was no difference at intervention 'information' between the observations and the results of the post questionnaire for this.

DISCUSSION

The interventions

Intervention 'information'

The intervention 'information' significantly increased the number of subjects that took a pre-swim shower before entering the pool (a rise of 23.5% to 28% of the subjects that took a pre-swim shower). This intervention was based on the assumption that the information on the signs was going to be central processed by the subjects, which was different from the other two interventions. It looked like the signs were indeed processed centrally, because it did work for intervention 'information' and not for the interventions 'routing game' and 'social norm'. These last two interventions were based on the assumption that the information on the sign was peripheral processed. Therefore, those signs could possibly not have worked, because the information they used does not have an effect when the central route is followed. Even though the preliminary study suggested the peripheral route was followed by the bathers, these results suggest that the central is followed.

However, the effect size of the intervention 'information' was minimal, just like the effect size in the research of Schultz et al. (2008). Further research could investigate whether this intervention really works. As Nandy (2012) states: "there could still be practical importance even for small effect sizes, especially in cases where cost and ease make it easy to be implemented on a large scale." This is the case with this intervention: it is easy to implement and the costs are low.

While the intervention 'information' was seen the least by the recreational swimmers according to the results of the post questionnaire, it had the biggest effect. This could be due to the small sample size of the post questionnaire at this intervention (n = 29). Further research could possibly provide a decisive answer of this finding.

Intervention 'routing game'

In contrast to intervention 'information', intervention 'routing game' was seen by most recreational swimmers (63.3%). This intervention was also based on the peripheral route, though it consisted of several signs plus footsteps all over the swimming pool and was therefore more noticeable than intervention 'information' and intervention 'social norm'. However, intervention 'routing game' showed little to no effect. This could be explained by several reasons. First of all, the intervention was based on the sign used in the study of Johnson, Sholcosky and Gabello, (2003), where they used a sign with the message: please

wash hands. This sign had an effect, although it was only a small effect. Therefore, a game element was added at the intervention used in this research. However, this addition did not have the desired effect.

When conducting the post questionnaire, many subjects thought that the stickers of the floor were for directions: which way they had to go for the showers. The routing aspect of the intervention was a medium to increase pre-swim showering, not the goal of the intervention. Therefore, it could be that this intervention was misinterpreted. Also, several subjects mentioned that their children were playing on the footsteps. They did see the game element of this intervention, however it seemed they missed the purpose of the intervention. Therefore, the game element was possibly not the right stimulus to add. Future research could find out whether other stimuli might have a greater influence.

Intervention 'social norm'

The third intervention 'social norm' did also not have the desired effect: there was no significant increase in the number of recreational swimmers taking a pre-swim shower. Although, the number did increase, this was not a significant raise. However, the amount of people that showered at the starting point was already much higher than at the other locations. That is why a smaller effect could be expected. However, it was a surprise that this intervention did not have the desired effect, because this intervention was completely designed after the example of Pol and Swankhuisen (2013). Their intervention had the desired effect (influence behaviour), however the intervention in this study did not. A possible explanation could be that the subjects at the intervention of Pol and Swankhuisen (2013) experienced more social responsibility, because this intervention was placed in their houses. The subjects in this study only stayed for a couple of hours and left the location after their visit. It might be that this decreased their sense of responsibility and hence explains why they did not act upon the message.

Characteristics recreational swimmers

To get a more general view of the study, the results of all the interventions were combined. An outcome of those results was that significantly more men than women did shower before entering the pool. This is partly not in line with the results of the study of Nichols (2014). This study was on washing hands and in his study, where more women than men washed their hands after a toilet visit (in general). However, the intervention Nichols (2014) used had a significant effect on men and not on women. That result is in line with the present study. The intervention that did work (intervention 'information') did have a significant effect on men,

not on women. Future research could possibly find out why this occurred, could it be that women are more difficult to influence, or should they be influenced in another way?
A different finding that was noticed at location A and C, was the difference in the number of subjects that said they have taken a pre-swim shower (self-report), and the observed number of subjects that actually did shower. A possible reason for this is could be a bias in conducting questionnaires among humans in general. The researcher conducted these questionnaires face to face and most subjects knew that showering before swimming was the 'right' behaviour (based on the own results) therefore it could be that they were ashamed to say they did not take a shower.

Limitations

Like every research, this study also has some limitations. First of all, there were several disturbing external factors during the research. For example, the baseline measurement was conducted in the spring and the post measurement was done in between spring and summer. This had a big disadvantage: the outdoor swimming pools at interventions 'routing game' and 'information' were open during the post measurement, however not during the baseline measurement. As a result several participants walked through the swimming pool, without showering, to the outdoor pool. These outdoor swimming pools and showers could not be observed simultaneous with the indoor swimming pools and therefore these were not taken into account. This was especially a problem on the first day at intervention 'routing game' and therefore the number of observed subjects was very low that day. The outdoor swimming pool did have other opening hours than the inside swimming pool. The remaining observation days were planned outside the opening hours of the outdoor pool. The problem of the outdoor swimming pool occurred also at intervention 'information', however this was not such a problem as at intervention 'routing game', due to a weather advantage, which means it was very rainy on two observations days and therefore the outdoor swimming pool was hardly used. There was no outdoor swimming pool at intervention C 'social norm', nevertheless there was a sunbathing area outside. This could have caused the same problem as the outdoor swimming pools and could therefore give a distorted view. Future research should take this into account when planning such a research.

A second limitation was the usage of only one researcher. This researcher made all the observations and hence this makes the method observation less reliable. However, another researcher joined the observer for one day. This made it possible to compare the results from both researchers and it appeared that both researchers' observations were similar.

A third limitation of this research is the invalid results of two water measurements used during the study to indicate the effectiveness of the interventions. The first measurement concerns water meters. These were placed at the showers and measured the water usage of the showers. The score was recorded several times a day during the observation days. In case more subjects showered before entering the pool after the intervention was placed, the water consumption should increase in comparison to the baseline study (assuming the water consumption after swimming remains constant). However, this measurement was not complete and could not really indicate anything and was therefore not taken into account in the research. The second way of measurement was done by weekly water samples. These samples could indicate if the water quality improved after the intervention. After all, when more subjects did take a shower, less pollution would come into the water (assuming everything else remains constant) and therefore the water should be cleaner. The results were scattered due to several reasons and therefore conclusions could not be drawn from these measurements and hence were disregarded.

A fourth limitation of this research was the small sample size of both the preliminary study and the post measurement. This gives a limited representation of the population in the swimming pool, especially at the post measurement. For example, minors could not participate in the questionnaires, which represented a very big part of the subjects in the main study.

The final limitation had to do with the visibility of the interventions. Several subjects reported that they had not noticed the interventions. It could be that the floor was not the right spot for the interventions. Perhaps the focus of the recreational swimmers was not on the ground; only on the swimming pool they were heading to.

Future research

Future research could indicate if there are better ways to influence visitors of swimming pools in order to persuade them to take a pre-swim shower and hence decrease the pollutants in the bathing water. The intervention ‘information’ had the desired effect, however further research can focus on how this effect could be optimized. Another research direction could be on norms: from this study turned out that the subjects knew what the norm was (take a shower before swimming), however they did not act like it. How is it possible to urge persons to act like the norm?

Next, there were some differences between sex and taking a shower. Further research could investigate what kind of intervention can influences both women and men. Why do women

shower less, or are they less compliant? Another result from the study showed that the younger age groups (0-10 and 11-20 years) showered the least. This was found at every intervention. The intervention 'information' had no significant effect on these age groups, only on two older age groups. Future research could cover how these youngsters can be positively influenced.

Group processes are also very interesting to investigate in this context. The findings of this study suggested that those are important, because subjects were less likely to take a shower when they came in with a couple of persons. It could be investigated how the shower behaviour of a whole group entering a swimming pool can be influenced.

The field experiment presented in this study could also be conducted at several other swimming pools: e.g. other recreational pools, sports pools, or pools at recreational parks. The type of visitor could also vary at those pools which is another interesting variable to take into account in future research. For example, do recreational swimmers show a different hygienic behaviour in swimming pools than sport swimmers?

The intervention themselves might also be further investigated. In what way can you get the highest persuasion rate? Directions of research for this can be: size, colour use, placing, and material of stimuli.

The observed results showed that the shower duration of most subjects (71% at intervention 'social norm' and 83% at intervention 'routing game') was less than 30 seconds. Like mentioned before, a shower duration should at least last for 30 seconds to rinse of 75% of the pollution from people's body (Keuten et al., 2012). Therefore, further research could also focus on, besides trying to make more bathers take a pre-swim shower, how to make the bathers take longer pre-swim showers.

The last example for possible research directions is the focus on incidental pollution (e.g. urinating). Human behaviour has to change in order to reduce this kind of pollution, just like in this study. Therefore: how could this incidental pollution decrease by a minimal intervention?

Practical implications

A practical implication for swimming pools can already be done based on the findings of this study. First of all, as mentioned before, intervention 'information' could already be used by swimming pools. It does increase the shower rate (although not very effectively yet) in an easy and cheap way. Second, with all interventions, fewer subjects showered when they carried belongings, up to a difference of 24.9%. At all interventions, these results were

significant. If swimming pools provide storing space for belongings, or manage somehow to find a way of carrying belongings and still take a shower, it could result in a higher shower rate.

CONCLUSION

Three major findings arose in this research, which could be important contributions to the current literature on behavioural influences and swimming pool hygiene. First of all: minimal interventions can influence hygienic behaviour. This was shown with intervention 'information': after the implementation of the intervention, the number of recreational swimmers that took a pre-swim shower increased. Therefore, with minimal effort and minimal costs, the behaviour of recreational swimmers can be influenced. Second, the subjects knew what the norm was: take a shower before entering the pool. However, even though they do know the proper behaviour, they certainly do not always act like it. Third and last: belongings play an important role in whether people take a shower or not. When bathers carried belongings, they were less likely to take a shower. These three main findings not only have an impact on the current literature, but can also have an important impact on the practices in swimming pools.

Overall, the present research did its job: with a small intervention, a great influence in behaviour could be achieved.

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APPENDIX A

Questionnaire preliminary study

UNIVERSITY OF TWENTE.

----Instruction-----

Thank you for your participation in this study of the University of Twente. Completing this questionnaire costs a few minutes. Below are some questions about hygiene in swimming pools. It is important that you answer all the questions honestly. This questionnaire consists of a total of **17 questions**. It is also important that you complete the questionnaire without consulting others. If you do not understand a question, please report this to the person that handed you this questionnaire. All information will be treated confidentially and your anonymity is guaranteed in this study. You can now start the questionnaire.

----Questionnaire----

1. Sex:
☐ Male ☐ Female

2. Age:
…….. years.

3. Came with:
☐ Alone ☐ Parent(s)/ adult supervisors ☐ 1 friend

☐ Several friends ☐ Sports group ☐ Schoolmates

☐ (Grand)child ☐ (Grand)children

4. How often do you go to a swimming pool? *(in total, so also other swimming pools)*
☐ Daily ☐ 5x a week ☐ 4x a week ☐ 3x a week

☐ 2x a week ☐ Weekly ☐ 3x a month ☐ 2x a month

☐ Monthly ☐ 6 to 11 x per a year ☐2 to 5x a year ☐ Yearly

☐ Less than once a year

5. For what reason did you come to the swimming pool? *(multiple answers possible)*
☐ Lap swimming ☐ Sports ☐ Recreational swimming

☐ Swimming lessons ☐ Rescue swimming

6. Are you familiar with the house rules of this swimming pool?
☐ Yes, via:…….. ☐ No *(skip question 7)*

7. Can you briefly indicate the topics of these house rules?
……
……
……
……
……
……
…….

8. Do you believe you can become ill from swimming water?
☐ Yes ☐ No

9. Did you shower at the showers of the swimming pool <u>before</u> entering the pool? *(Shower at home does not count)*
☐ Yes ☐ No

10. Can you briefly describe your reason for (not) taking a shower <u>before</u> entering the pool? *(Multiple answers possible)*
……
……
……
……
……
……
…….

*Only fill in the questions in the blocks below if you answered question **9** with YES. Did you answer NO to question **9**, please continue with question **15**.*

11. How did you shower?
☐ Walked underneath ☐ Rinsed (parts of the body)
☐ Rinsed (whole body) ☐ Thoroughly scrubbed (parts of the body)
☐ Thoroughly scrubbed (whole body) ☐ Otherwise, namely……

12. Did you wet your hair during the showering before entering the pool?
☐ Yes ☐ No

13. Did you use shampoo/soap during the showering before entering the pool?
☐ Yes, both ☐ Yes, shampoo ☐ Yes, soap

☐ No

14. How long did you shower at the showers at the swimming pool before entering the pool *(estimated)*?
☐ 1-10 seconds ☐ 10 seconds - minute ☐ 1-2 minutes

☐ Over 2 minutes

Continue with question 15

15. Did the people you came with took a shower before entering the pool? *(When you came alone, please fill in: not applicable)*
☐ Yes, everyone ☐ Yes, but not everyone ☐ No ☐ I do not know

☐ Not applicable

16. Do you believe people should take a shower in general before entering the pool? Why (not)? *(Multiple answers possible)*
……
……
……
……
……
……
……

17. Which of the following products did you use before going to the pool? *(Multiple answers possible)*
☐ Hairspray/mousse ☐ Gel/ wax ☐ Deodorant ☐ Body lotion

☐ Perfume ☐ Crème ☐ Make-up

☐ No products

Thank you for your participating in this study. U can now return this form to the researcher.

---*The End*----

APPENDIX B

Post questionnaire

UNIVERSITY OF TWENTE.

----Instruction-----

Thank you for your participation in this study of the University of Twente. Completing this questionnaire costs about 2 minutes. Below are some questions about hygiene in swimming pools. It is important that you answer all the questions honestly. This questionnaire consists of a total of **19 questions**. It is also important that you complete the questionnaire without consulting others. If you do not understand a question, please report this to the person that handed you this questionnaire. All information will be treated confidentially and your anonymity is guaranteed in this study. You can now start the questionnaire.

----Questionnaire----

1. Sex:
☐ Male ☐ Female

2. Age:
…….. years.

3. Came with:
☐ Alone ☐ Parent(s)/ adult supervisors ☐ 1 friend

☐ Several friends ☐ Sports group ☐ Schoolmates

☐ (Grand)child ☐ (Grand)children

4. How often do you go to a swimming pool? *(in total, so also other swimming pools)*
☐ Daily ☐ 5x a week ☐ 4x a week ☐ 3x a week

☐ 2x a week ☐ Weekly ☐ 3x a month ☐ 2x a month

☐ Monthly ☐ 6 to 11 x per a year ☐2 to 5x a year ☐ Yearly

☐ Less than once a year

5. For what reason did you come to the swimming pool? *(multiple answers possible)*
☐ Lap swimming ☐ Sports ☐ Recreational swimming

☐ Swimming lessons ☐ Rescue swimming

6. Did you shower at the showers of the swimming pool before entering the pool? *(Shower at home does not count)*
☐ Yes ☐ No

7. Can you briefly describe your reason for (not) taking a shower before entering the pool? *(Multiple answers possible)*
……
……
……
……
……
……

*Only fill in the question in the blocks below if you answered question **6** with YES. Did you answer NO to question **6**, please continue with question **12**.*

8. How did you shower?
☐ Walked underneath ☐ Rinsed (parts of the body)

☐ Rinsed (whole body) ☐ Thoroughly scrubbed (parts of the body)

☐ Thoroughly scrubbed (whole body) ☐ Otherwise, namely……

9. Did you wetted your hair during the showering before entering the pool?
☐ Yes ☐ No

10. Did you use shampoo/soap during the showering before entering the pool?
☐ Yes, both ☐ Yes, shampoo ☐ Yes, soap

☐ No

11. How long did you shower at the showers at the swimming pool before entering the pool *(estimated)*?
☐ 1-10 seconds ☐ 10 seconds - minute ☐ 1-2 minutes

☐ Over 2 minutes

Continue with question 12

12. Did the people you came with took a shower before entering the pool? *(When you came alone, please fill in: not applicable)*

☐ Yes, everyone ☐ Yes, but not everyone ☐ No ☐ I do not know

☐ Not applicable

13. Which of the following products did you use before going to the pool? *(Multiple answers possible)*

☐ Hairspray/mousse ☐ Gel/ wax ☐ Deodorant ☐ Body lotion

☐ Perfume ☐ Crème ☐ Make-up

☐ No products

14. Did you see a sticker/several stickers at the floor/wall of the swimming pool?

☐ Yes ☐ No

*Only fill in the questions in the blocks below if you answered question **14** with YES. Did you answer NO to question **14**, please continue with question **19**.*

15. Can you briefly describe what you saw on the sticker(s)?

……
……
……
……

16. According to you: what was the message of the sticker(s)?

……
……
……
……

17. Did you do something with this message? If yes, what? If no, why not?

……
……
……
……

18. What did you think of the sticker(s)?

……...
……..
……..
……..

Continue with question 19

19. Did you go to the outdoor swimming pool?

☐ Yes, first ☐ Yes, but I first went to the indoor pool ☐ No

Thank you for your participating in this study.

---The End----