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"I don't just drink water for the sake of it": Understanding the influence of value, reward, self-identity and early life on water drinking behaviour.

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Highlights

- Associating water with reward was associated with high, consistent, and subjectively effortless intake.
- Drinking water out of obligation (i.e., no reward) was associated with low, inconsistent, and effortful intake.
- Participants with health-conscious self-identities were more likely to associate water with reward.
- The association between health-consciousness and reward was disrupted when other aspects of self-identity were more prominent.
- Drinking patterns from early life persisted into later life and were experienced as hard to change.

Abstract

The prevalence and negative health outcomes of underhydration call for a better understanding of water drinking motivations to inform interventions. This mixed methods study assessed the motivational processes underlying different patterns of water intake (i.e., high versus low) with a focus on the constructs like value, reward, self-identity and early life drinking habits. We used an initial quantitative survey (N = 400, *M age = 24,* N *female = 293*), followed by a qualitative survey (N = 101, *M age = 33,* N *female* = 75) in the general UK population. The quantitative survey assessed self-reported differences in water drinking behaviour (e.g., amount and frequency) in high and low water drinkers. The qualitative survey assessed underlying reasons for these differences, in a subset of participants. Participants who associated water drinking with valued, rewarding outcomes were more likely to drink a high and consistent amount of water, with less subjective effort than participants who did not. Participants with health-conscious self-identities were more likely to associate water drinking with reward, but this association was disrupted in situations where other aspects of self-identity were prominent. Finally, for many participants drinking patterns from early life persisted into later life and were experienced as hard to change. Our results suggest that reward may be important in habit formation and maintenance. Interventions trying to increase water intake need to make water rewarding in line with drinking outcomes that people value. Early intervention is essential given the persistence of early life drinking habits.

Keywords: water intake; underhydration; behaviour change; mixed methods; habits; reward

1. Introduction

Underhydration has been linked to an increased risk of major health issues such as chronic kidney disease, cardiovascular disease and obesity (Armstrong & Johnson, 2018; Perrier et al., 2020; Seal et al., 2019). Large proportions of populations in industrialized nations do not drink the recommended amount of water (Drewnowski et al., 2013; Ferreira-Pêgo et al., 2015) and so could be underhydrated. Therefore, it is important to develop effective interventions to increase peoples' water intake to avoid negative health outcomes. However, we first need a better understanding of what conscious or unconscious motivational processes drive peoples' daily water drinking behaviour, such as reward and habit. Although variables such as taste, lack of availability, health beliefs and social norms have been associated with water intake (Block et al., 2013; Hess et al., 2019; Vézina-Im & Beaulieu, 2019), previous research does not address examine the processes through which they affect whether people drink or do not drink water during the day.

A recent qualitative exploration of these processes outlined a broad range of processes that seemed to drive peoples' water drinking behaviour (Rodger et al., 2021)(Rodger et al., 2021). A key process we identified was that most participants had low and inconsistent water intake because they developed situated water drinking habits that were limited to a small number of specific situations. Gardner (2015) defines habit "as a process by which a stimulus automatically generates an impulse towards action, based on learned stimulus-response associations." In the situated water drinking habits that participants described, water drinking seemed to be cued or modulated by a variety of contextual factors such as internal cues (e.g., thirst) or cognitive states (e.g., distraction) (Rodger et al., 2021). In many cases, situated water drinking habits were associated with low and inconsistent water intake because participants were unlikely to drink water outside of their habitual situations, and their habitual situations occurred infrequently. In contrast, participants who perceived water

drinking as part of their self-identity seemed to perform this behaviour with high automaticity across a variety of different daily situations, and therefore had high and consistent water intake.

Self-identity has also been associated with other health behaviours. In the domain of eating, health-conscious self-identity predicts fruit and vegetable consumption intentions and behaviours (Canova et al., 2020; Carfora et al., 2016) as well as healthy eating habits (McCarthy et al., 2017). People tend to make consistent efforts to eat food that fits their self-identity (Bisogni et al., 2002), and experience negative affect when they do not do so (Bisogni et al., 2002; Strachan & Brawley, 2008). Although self-identity is a major factor affecting a variety of health behaviours (Freijy & Kothe, 2013; Stone & Focella, 2011), no previous research has directly examined its role in water drinking. The present article therefore assesses the role of self-identity in water drinking, while remaining aware of the potential roles of other variables as outlined by previous research.

Self-identity is the mental representation a person holds about themselves based on memories, beliefs, motivations and emotions as well as interactions with other people and the wider environment (Verplanken & Sui, 2019). Self-identity may be an underlying causal mechanism of behaviour, as people seek to perform behaviours that are in line with what they value (McCarthy et al., 2017; Verplanken & Sui, 2019). Identity Based Motivation theory suggests that different situations cue different aspects of self-identity and influence how people interpret these aspects of self-identity (Oyserman, 2009). Therefore, the ability of self-identity to predict behaviour is dependent on the stability of the situations cueing self-identity (Oyserman, 2015). Once a behaviour is linked to self-identity, it is likely to be repeated (Oyserman, 2009). Therefore, behaviours linked to self-identity could theoretically become habitual through repeated performance. Indeed, one of the items on the Self-Report Habit Index, which is often used to assess the perceived habitualness of behaviours, includes an

item on self-identity as although it may not be the case for all habits, some habits may be associated with self-identity (Verplanken & Orbell, 2003). To our knowledge, however, there is limited research on this link, and the appropriateness of including self-identity in the Self-Report Habit Index is questioned within the habit literature (Rebar et al., 2018). Habits, in turn, are a key predictor of many health behaviours (Gardner et al., 2019), and as we previously outlined have been found to play a role in water drinking behaviour (Rodger et al., 2021).

Although our initial focus was self-identity, we interpreted value and reward as prominent variables affecting participants water drinking behaviour during data familiarisation. Our survey also generated relevant data on participants perceptions of how their water drinking patterns had changed from early life. We therefore adapted the research questions to include these insights. Briefly, value refers to people's judgements of the importance, usefulness and worth of consumption behaviours, which are informed by numerous, heterogenous input variables (Berkman, 2018). For example, the value of eating healthy may be informed by variables such as the effort needed to perform this behaviour, social norms, and identity relevance (Berkman, 2018). Reward refers to a desirable outcome a person may expect to occur because of their consumption behaviour, and which motivates the performance of this behaviour (Shiota et al., 2021). For example, peoples' representations of the immediate reward associated with a consumption of a drink predicts intake of that drink (E. K. Papies et al., 2021).

Here, we used mixed methods to understand the impact of self-identity on water drinking behaviour. Collecting mixed methods data for completeness (McEvoy & Richards, 2006) is in line with our critical realist perspective (Fletcher, 2017).

In the quantitative stage we validated that were differences in water drinking and water drinking related behaviours between the two different water drinking identity groups we

created. We assessed the behaviours of participants (N = 400) who self-identified as "real water drinkers" or not. We hypothesised that participants who identified as "real water drinkers" would report: drinking a higher amount of water (Hyp. 1); drinking water more frequently (Hyp. 2), in a higher number of situations (Hyp. 3), and more automatically (Hyp. 4); perceiving drinking water as easier (Hyp. 5), having more knowledge of water's importance (Hyp. 6), having lighter average daily urine colour (Hyp. 7) and having a lower frequency of dehydration symptoms (Hyp. 8).

In the qualitative stage, we explored the underlying motivations (i.e., self-identity, value, and reward) that could explain the differences in water drinking behaviour, through a qualitative survey (N = 101). This stage addressed the following research questions: (1) How do people conceptualise water drinking as part of their self-identity and how does this impact the nature (e.g. amount and consistency) of people's water drinking behaviour? (2) How does the value people ascribe to water drinking and the reward they experience from water drinking shape the effectiveness of their water drinking behaviour? (3) How do people perceive their water drinking patterns in the present compared to early life?

2. Methods

This research was approved by the University of Glasgow Ethics committee. See https://osf.io/w4eq7 for preregistration, supplementary materials, and data.

2.1 Survey Development

Both surveys were created on Qualtrics (www.qualtrics.com)

2.1.1 Quantitative Survey

The quantitative survey started with the question, "Do you consider yourself a 'real water drinker'?, Yes or No," to create two groups of participants who would be more vs. less likely to perceive water drinking as part of their self-identity.

Participants then answered questions on their water intake amount (ml), water intake frequency (instances per week), number of water drinking situations, automaticity (Gardner et al., 2012), perception of ease of drinking water, perception of knowledge, urine colour (See Figure 1), and frequency of dehydration symptoms. Table 1 outlines how each variable was measured.

All variables were included based on prior research (Rodger et al., 2021), which showed that participants who perceived water drinking as part of their self-identity typically drank a high amount of water through drinking often in various situations, even if they only drank small amounts each time. These participants also seemed to drink water automatically, reporting that it did not take conscious thought or subjective effort, and they understood why water drinking was important. Finally, these participants reported light urine colours. Therefore, in the current study, we expected to see these patterns, along with infrequent dehydration symptoms, in the group who identified as "real water drinkers", compared to those participants who did not identify as "real water drinkers". Validated surveys on fluid intake and water drinking behaviour also informed our question development (Veilleux et al., 2020).

[Insert Table 1 here]

[Insert Figure 1here]

2.1.2 Qualitative Survey

Qualitative surveys allow researchers to explore under-researched phenomena while capturing varied perspectives (Braun et al., 2020). This method is sometimes thought to generate data that lacks depth given its inability to probe participants. However, Braun and colleagues (2020) show that this method generates data that can provide meaningful insights when viewed as a whole, even when individual responses are brief. This approach also offers anonymity, allowing participants to discuss topics they might choose not to discuss in

interviews. For example, from our experience participants were uncomfortable discussing toilet breaks being a barrier to drinking water during interviews. Finally, data collection occurred during COVID-19, so we judged online qualitative surveys to be a safe and practical method of data collection.

We created our qualitative survey by consulting prior research on the role of self-identity in eating behaviour (Bisogni et al., 2002; McCarthy et al., 2017), results from our previous study (Rodger et al., 2020), the aims of this study, and recommendations by Braun and colleagues (2020). We designed the questions to access participants' perspective on what motivates their water drinking, focusing on self-identity. The term "self-identity" was not used in the survey as previous research has shown some participants may struggle understanding it (Bisogni et al., 2012). The surveys for participants who responded "yes" and those who responded "no" to being a "real water drinker" were as similar as possible. The final surveys had 11 and 12 open ended questions, respectively, ordered from broader to more specific questions (see Table 2), and responses had no word limit.

[Insert Table 2 here]

Table 3 summaries the quantity of data we generated. Each participant seemed engaged, writing at least a sentence per response, but usually more. Data quantity was not the sole feature for determining data quality. As Table 4 shows the content of both low and high word count responses contributed meaningfully to the analysis process. We judged our data to be high quality if it allowed us to address the research questions by providing theoretical or practical considerations through a meaningful narrative (Braun & Clarke, 2021) that was robust to alternative explanations (Korstjens & Moser, 2018).

[Insert Table 3 here]

[Insert Table 4 here]

2.2 Participants, Recruitment, and Procedure

All data was collected via the online participant recruitment platform prolific (www.prolific.co). Online-recruitment platforms come with challenges such as sampling bias, potentially poor data quality, and unethical participant treatment (Newman et al., 2021). We chose Prolific as it provides more representative participant samples and ethical payment terms (Newman et al., 2021; Palan & Schitter, 2018). We also followed recommendations by Newman and colleagues (2021) for addressing poor data quality concerns.

We collected data from 400 participants for the quantitative survey on 16th December 2020 (average duration 4 minutes, £0.63). This sample size was determined by power calculations using data simulation and the smallest effect size of interest (see "quantitative supplement" for an overview). The inclusion criteria were fluent English speaker, 18+ years of age, and currently living in the UK. Participants were only excluded from a specific analysis if they had missing data for the dependent variable related to that analysis, and the number of participants per group is presented for each analysis in the results section. See Table 5 for participant demographics.

[Insert Table 5 here]

We collected data from 101 of the 400 quantitative survey participants for the qualitative survey on 16th – 17th December 2020 (average duration 27 minutes, £3.75). All quantitative survey participants were invited to participate in the relevant qualitative survey, until we had reached the planned number of participants. We did not collect qualitative data from all 400 participants as we determined that a moderate sample size was sufficient to provide high quality data to address our research questions based on recommendations from Braun & Clarke (2021). One extra participant was added to the "yes" survey as this participant contacted AR outlining that they wanted their data included despite technical difficulties. See Table 6 for participant demographics. The mean age of qualitative survey

participants was nine years higher than the quantitively survey. This may indicate that older participants were more likely to take part in the qualitative survey.

[Insert Table 6 here]

Given that most participants in this sample identified as being either "White" or "Female", generalisations of our results to samples with different demographic profiles should be made tentatively. However, our analysis focused on making interpretations of trends that were evidenced across the sample as whole, rather than trends evidenced by only the predominantly represented demographic groups.

Finally, although data was collected during COVID-19, the impact of the pandemic was not a focus of our study which instead aimed to assess trends in participants' water drinking behaviour and water drinking motivations that would likely be relevant regardless of the pandemic. Therefore, we did not ask participants any questions directly related to this. We instead reasoned that participants had the opportunity to spontaneously mention the pandemic where it was relevant to their experience, and that we could contextualise our findings appropriately if needed.

2.3 Data Analysis

We started with the qualitative analysis as we reasoned that support for our hypotheses in the quantitative analysis could cause us to over-emphasise group differences and ignore similarities during the qualitative analysis.

All qualitative analyses were conducted in Nvivo (Mac Version 12). AR used reflexive thematic analysis (Braun & Clarke, 2006, 2019) as this allowed her to generate tendencies in participants' experience across the dataset. AR primarily analysed the data at the descriptive level of the participants subjective experience using descriptive coding, derived mainly from the data. Themes were not generated using a single core feature in the data, but instead themes had a core idea that linked multiple features of the data together. We

decided that AR should treat both survey groups as one dataset initially so that she did not ignore tendencies that were shared across the groups. She then considered them separately to see whether the interpretation of the data within each code was different per group.

During analysis AR noted that constructs of value and reward seemed to be important in understanding water drinking, so she proceeded to examine how value and reward were associated with water drinking and amended the research questions to assess this. Weekly meetings with EP during analysis led to a critical dialogue on the relevance and strength of each theme as well as alternative explanations. AR also kept a reflexivity journal during analysis to document reflexive thoughts on how AR and EP's backgrounds influenced the analysis process. For example, our prior study on water drinking behaviour (Rodger et al., 2021) was a prominent theorical influence on the entire research process.

AR conducted all quantitative analyses in R (R Core Team, 2014) and Table 7 outlines how the group differences were assessed for each variable. During discussions on the descriptive analysis, we made the following amendments to the preregistered analysis plan: (1) Extreme outliers were not removed, but we treated these as naturally occurring outliers. AR ran sensitivity analyses (see "quantitative supplement") when extreme outliers were present (i.e., water intake amount and frequency) to assess the impact of these data points on the model parameters. Removal of extreme outliers always resulted in a slightly larger effect size than the models presented in the main manuscript. (2) The analysis using "number of situations" as a dependent variable was modelled using ordinal regression (Christensen, 2018) rather than a simple linear regression, as this variable was ordinal rather than continuous.

[Insert Table 7. here]

[Insert Figure 2. here]

3. Results

3.1 Quantitative Results

In line with our hypotheses, the "real water drinker - yes" group reported drinking more water (Hyp. 1), more frequently (Hyp. 2) and in a higher number of situations (Hyp. 3) than the "no"-group. The "yes"-group reported drinking 873.96ml more water per day, having 29 more instances of water intake per week. They were 5.14 times more likely to report drinking water in a higher number of situations.

In line with our hypotheses, the "real water drinker -yes" group also reported drinking water more automatically (Hyp. 4) and with a higher subjective ease (Hyp. 5) than the "no"-group. The "yes"-group reported a 30.96 higher mean automaticity score and a 23.27 higher mean score on the subjective ease item, on 100-point scales.

In line with our hypothesis, the "real water drinker - yes" group also reported having more perceived knowledge on water drinking's importance (Hyp. 6) than the "no"-group, indicated by a 6.55 higher mean score on the perception of knowledge item, again on a 100-point scale.

Finally, in line with our hypotheses the "real water drinker - yes" group also reported having lighter urine colours (Hyp. 7) and fewer experiences of dehydration symptoms (Hyp. 8: 11.28 lower score) than the "no"-group. The "no"-group were 4.32 times more likely to report darker urine colours).

Figures 3 and 4 show the distribution and spread of each variable by group, and Table 8 summarises the descriptive statistics of each variable by group.

[Insert Figure 3, Figure 4, and Table 8 here]

The differences between the two groups outlined above were all significant ($p < 0.00125$), suggesting that the "real water drinker – yes" group had different water drinking experiences, behaviours, and outcomes compared to the "no" group. Table 9 summarises the hypothesis test statistics for the group differences we outlined above.

[Insert Table 9 here]

3.2 Qualitative Survey Results

We generated four themes (see Table 10 for an overview) covering: drinking water with a sense of value and reward (Theme 1) as well as out of obligation (Theme 2), the association between self-identity and water drinking (Theme 3), and the persistence of drinking patterns from early life (Theme 4). Although most of the evidence for Theme 1 and Theme 2 came from participants in the "real water drinker - yes" and "real water drinker - no" groups respectively, these themes did not directly map on to each group. We use the suffix RWD (i.e., real water drinker) after participant numbers to denote when a supporting quote came from the "real water drinker - yes" group. Quotes without this suffix came from the "real water drinker - no" group. Additional supporting quotes are provided in the supplementary materials.

3.2.1 Theme 1: "I don't just drink water for the sake of it" – Drinking Water with a Sense of Value

The most common and simple motivation to drink water expressed by participants was to quench thirst: "If I am thirsty, I drink" [P45, RWD] and "I just drink when I'm thirsty" [P2]. However, participants who drank a high and consistent amount of water did not value water solely because it quenched their thirst. These participants' responses suggested that they valued drinks that were good for their wellbeing or provided them hedonic pleasure, and that they felt rewarded by drinking water because this resulted in valued outcomes: "I don't just drink water for the sake of it. I drink it because I enjoy the experience, how it makes me feel and the overall health benefits I notice" [P36, RWD].

The specific reasons participants gave for valuing water fell into three broad categories, with many participants mentioning several of these reasons. The first category was the tangible impact water drinking had on wellbeing: "[Water] makes me stay happy,

healthy, with good hair and skin. It keeps me alert and stops the cravings for a snack" [P12a, RWD]. The second category was hedonic enjoyment of water: "I really enjoy water […] it gives me pleasure" [P27, RWD]. Finally, the last category was beliefs that hydration is important or necessary for health: "[I am] a person who understands the importance of staying hydrated via water […] that no other drink is a substitute for water" [P14, RWD]. Tangible impact and hedonic enjoyment were the most common.

When participants valued water's tangible impact on wellbeing or hedonic enjoyment, they seemed to experience an almost immediate outcome from water drinking. This outcome could be rewarding when water drinking occurred (e.g., improved mood), but could also be adverse when water drinking did not occur (e.g., fatigue): "I can notice a huge difference in my mood and how well I operate on a day-to-day basis when I am properly hydrated versus not" [P16, RWD]. Not all participants experienced adverse outcomes when they did not drink water, for example, "if for some reason I forget [to drink water] does not affect me" [P3, RWD].

When participants valued water due to their belief that hydration water was important or necessary for health, this belief seemed to be enough to get them to drink water in the present, despite no clear evidence that they experienced short-term rewards from drinking: "I value the health benefits… water is a simple necessity, so I drink it, but I have never noticed specific health effects as a result" [P7, RWD].

Participants who valued water drinking and perceived it as rewarding thought drinking water was easy, habitual or automatic (e.g., "it's so automatic that you don't even notice when you drink it" [P28, RWD]) and it was their default drink choice: "My drink of choice is water. It is the first drink I go to instead of tea/coffee, fizzy drinks or alcohol" [P20, RWD]. This meant that there were very few and infrequent situations (e.g., socializing situations) during the day that would limit these participants' intake: "I will occasionally have

a can of Pepsi or Coca-Cola when I'm out eating but this rarely happens as I prefer water" [P7, RWD]. The automaticity and subjective ease with which these participants described their water intake could indicate that this behaviour was habitual, as self-reported automaticity is commonly used to capture the relationship between habit and behaviour (Gardner et al., 2012).

Participant's descriptions of water intake suggested that there was a lot of preparation involved in making water easy to access. This preparation behaviour, too, appeared easy and automatic for these participants indicating that it could also be habitual. For example, preparation behaviours such as always having a bottle on hand, were common: "I don't really realise I'm drinking until the bottle is empty. I keep a water filter always topped up as well so I can refill the bottle easily" [P28, RWD], but participants described doing these preparation behaviours using phrases such as, "it's relatively easy as it's habit," illustrating the subjective ease of this preparation behaviour. However, for someone who does not 'habitually' make sure they have a bottle wherever they go, this may be experienced as effortful. Therefore, appraisals of the ease of drinking water seemed to be inherently subjective.

3.2.2 Theme 2: "I don't drink it because I enjoy it, I just know I should" - Drinking Water out of Obligation

Many of the participants who had low and inconsistent water intake seemed to be motivated to drink water out of obligation as they frequently used of phrases such as "I should," "I need," "a chore," and "I force myself" when they described drinking water: "I drink water because I feel I should for my body's functioning. Very occasionally when I am very thirsty or it is very hot, is drinking water anything other than a chore" [P13]. Descriptions like this seemed to communicate that these participants viewed drinking water as an effortful and unpleasant task they should perform, stemming from a general perception that water drinking was a healthy behaviour

Underlying this sense of obligation, however, was a lack of actual value ascribed to water drinking, because these participants rarely experienced reward or adverse outcomes from drinking or not drinking water, respectively. If they did not feel thirsty or dehydrated, water drinking was viewed at best as a neutral activity: “If water was the only option, I'd be reasonably happy to drink it.” [P33]. These participants often expressed that when they increased their water intake or did not drink water this had no noticeable impact on them, indicating that they did not experience any rewarding outcomes, which contrasts with the participants in Theme 1 who did: “I don't feel negatively impacted by [not drinking water]. My concentration is satisfactory, and my attention span is not affected by this” [P12]. These participants were also unlikely to experience any hedonic enjoyment from drinking water: “I just find it so boring!” [P23].

These participants also preferred other drinks over water and perceived those other drinks as providing rewards that water cannot. For example, coffee providing energy or tea creating a calm mood state: “I drink a lot of caffeine as I have young kids who wake a lot at night-time, and I feel exhausted” [P25]. Other drinks were the default drink choice for these participants in the majority of situations and they would only drink water in very specific situations such as during exercise: “If I go to the gym I will have a water bottle […] but I would rarely ever choose to drink water” [P23]. For some of these participants drinking water seemed like a last resort and even then, they did not seem like they would enjoy it or even choose to drink it: “if there's anything else to drink, I probably will always choose something else […] if there's only tap water, I'm not necessarily going to drink it” [P32].

Participants’ lack of motivation to drink water was also illustrated when they expressed that although water was technically available to them in most situations, they would not choose it or even consider choosing it: “I could technically always have water with me making it easy to drink like they do, but I don't like water” [P45]. These participants’

view of water drinking as easy and accessible, when they considering this behaviour more generally, contrasted with the effort (e.g., "force" and "chore") they illustrated when they discussed actual instances of drinking water.

3.2.3 Theme 3: Self-Identity and Water Drinking Behaviour

The value that some participants with high water intake ascribed to water seemed to be informed by aspects of their self-identity, and the most prominent identity aspect that was mentioned was being health conscious. Health-conscious participants seemed to value water drinking because it was in line with the importance that they placed on taking care of their health, or because it made them feel like a healthy person: "I think starting to become healthier and more conscious of what I eat/drink made drinking water seem more important" [P19, RWD]. For some of these participants, health-consciousness was closely related to age as they expressed a shift in their self-identity as they got older to include health-consciousness: "I changed to drink water in the last couple years […] I'm getting older and I want to keep myself as healthy as possible" [P10, RWD]. The influence of health-consciousness on the value participants ascribed to water was also illustrated by participants' with low water intake as they seemed to lack motivation to drink water because they did not perceive themselves as health-conscious: "I keep myself occupied with other things […] taking care of my health isn't at the forefront" [P44].

When health-conscious participants described the impact their self-identity had on water drinking, it seemed that health-consciousness motivated these participants to drink water as this was in line with their self-identity: "[being health-conscious] encourages me to drink more as to not break my fragile self-perception of being healthy" [P33, RWD]. Health-consciousness also seemed to lead to adverse outcomes for these participants if they had not drunk water as this was not in line with their self-identity: "[health-consciousness] makes me

more likely to put the effort into drinking. Makes me feel guilty if I don't consume enough water" [P19, RWD].

Other aspects of self-identity seemed to be prioritised over health-consciousness in certain situations or more broadly during a participant's daily life, such that health-consciousness did not always seem to motivate water drinking. For example, Participant 26 (RWD) discussed stopping their water drinking behaviour during religious fasts: "When fasting for religious reasons - e.g. Karva Chauth, Ramadan. [Not drinking water] did impact me and at times I found that I needed to break the rules for my own health." In situations characterised by religious traditions, this participant felt that they were expected to prioritise behaviours in line with their religious identity over those in line with health-consciousness, and so their water intake changed. When this participant decided to drink water during this religious situation, their use of "break the rules" suggests they experienced conflict between what was expected of them as a religious person and what was expected of them as a health-conscious person. Another example is Participant 47, who said that they were "generally quite a healthy person so my water consumption doesn't tally with that," but they reasoned that they were, "now a mother […] I'm too busy to think about drinking water. I drink a lot of caffeine instead." This participant seemed to prioritise being a mother over being health-conscious and so her drinking choices aligned the with the expectations of being a mother over the expectations of being healthy.

Whether a participant related water drinking to their identity as part of a social group or not, seemed to depend on if they felt water had a social signalling function. For some participants, drinking water signalled to others that were heath-conscious or an in-group member in certain social groups, and this could be experienced as rewarding for some participants but not all of them: "My parents have noticed I drink a lot of water. It makes me feel good as it is a reminder that I am improving my health." [P6, RWD] and "a lot of my

friends and colleagues are dedicated water drinkers so it's not unusual" [P25, RWD]. However, there were many participants who thought that people in their social groups had no opinions about their water drinking and that others' opinions would not change their water drinking: "I can't imagine anyone else pays any attention to how much water I drink." [P47, RWD]. Water drinking seemed to be an individualistic behaviour for these participants that did not serve any social signalling function and was not related to social identity.

Although self-identity seemed to inform the value some participants ascribed to water and motivate water drinking behaviour, this was uncertain for others. Although Participant 5 (RWD) outlined valuing water as being, "good for your health," and this could be interpreted as them having a health-conscious identity, this interpretation seems unlikely. They consistently referred to their enjoyment of water and their water drinking routine at home when describing why they drank water indicating that hedonic enjoyment and a situated water drinking habit (Rodger et al., 2021) are more likely to be motivating their water intake. For example, "It's easy for me to drink water because I really enjoy it," and "I always have a few water bottles in circulation, and when I get one out the fridge I fill another one up and put it in there as a treat for later." Although health-consciousness could be present, it did not seem to be a salient part of this participant's perspective of what motivated their water drinking behaviour.

3.2.4 Theme 4: "It has always been this way for me" – The Persistence of Drinking Patterns from Early Life

When reflecting on their drinking patterns throughout their life, many participants expressed a similar sentiment as Participant 2 (RWD) who said, "[Their water drinking] has always been this way for me," suggesting that their drinking patterns in the present had not changed much, if at all, from the patterns they had growing up.

The participants who drank water from a young age suggested that in doing so they never developed a preference for other drinks. Some of these participants indicated that they had never liked the taste of other drinks, so water was their default choice growing up: “I never drank very sugary drinks when I was growing up as I never had the taste for them. I much preferred milk or water” [P29, RWD]. Phrases like “I never have been interested [in sugary drinks]” suggest that these participants felt they were in control of the decision to drink water as a child. Other participants suggested that choosing water growing up was due to a guardian making other drinks options unavailable to them: “[drinking water is] something I have always done, when younger I was not allowed to have fizzy drinks” [P23, RWD]. These early interventions geared preferences and default drink choices toward water.

Similarly, participants who drank drinks other than water from an early age attributed their lack of interest in water drinking to early life: “I've not grown-up drinking water so don't think it's in my nature” [P43]. Some participants suggested that they do not drink or value water because it was never modelled or encouraged by their guardians: “I think I was always in the habit of not drinking very much water […] My parents never drank much water so it was not something we were encouraged to do” [P10]. Other participants explained that they had always had a preference for other drinks growing up and this informed their drinking patterns in the present: “Ever since I was a child I have avoided drinking water and would always ask for squash as a day to day drink” [P42]. Phrases such as, “don't think it's in my nature” and “isn’t ingrained as such for me” when they explained why they did not drink water suggest that these participants perceive their early drinking patterns as at least part of the reason they struggle to drink water in the present.

The essence of this theme is not to state that all childhood drinking patterns will persist into adulthood as there were some, like Participant 26, who discussed a shift towards drinking water later in life: “I used to refuse to drink water when I was a child and now, I ask

my mother to buy me water." However, the tendency for drinking patterns to be relatively stable across vast periods of these participants lives was striking to us. Even when changes to drinking patterns were made, this change came after a long period of maintaining childhood drinking patterns. Participant 26 stated that they only started drinking water when they "went to university." Additionally, they also stated that making this change was difficult due to their previous childhood drinking patterns: "[I] have to force myself to remember to drink it […] I didn't grow up drinking water all the time so it's not routine to me."

4. Discussion

Our study on water drinking motivations suggests that reward and value may play important roles in explaining the nature of participants' water drinking. Participants who associated water drinking with valued, rewarding outcomes, were more likely to drink a high and consistent amount of water, in more situations, and with less subjective effort, compared to participants who associated water drinking with unvalued, unrewarding outcomes. Participants who valued water and experienced it as rewarding also reported that preparation and water drinking behaviours were subjectively effortless (i.e., automatic in terms of efficiency; Moors & De Houwer, 2006). When reward and value were low, participants seemed to lack the motivation to prepare or drink water, and they experienced these behaviours as subjectively effortful.

Our findings indicate that it is important to understand the value people ascribe to drinking outcomes, as value informs what goals underly their drinking behaviour and therefore, whether they will experience drinking outcomes as rewarding. For example, if someone values taste over health with regards to drink choices, then drinking water to gain a tangible wellbeing benefit may not be viewed as rewarding as drinking a sugary drink for hedonic pleasure. Indeed, in research on food choices, health-focused attitudes were associated with heathier food choice whereas, taste focused attitudes were associated with

unhealthier food choice (Zandstra et al., 2001). Our findings are in line with this pattern and can inform whether emphasising health benefits or increasing perceived or actual tastiness of water will be effective interventions for different groups, depending on their attitudes. Our findings are also in line with recent work showing that drinking beverages, including water, more frequently was associated with thinking about them more in terms of immediate consumption and reward experiences, and that these cognitive representations in turn predicted desire to consume and intake (E. Papies et al., 2020). However, thoughts about health consequences had little predictive value for motivation and intake, which differs from the findings reported here.

Our research further indicates that participants who experienced water as rewarding also were more likely to describe drinking water with greater automaticity. In studies on habit formation, reward has been shown to increase automaticity indirectly through two routes. Reward can increase the frequency of performance, and therefore increase automaticity through practice. In addition, reward can moderate the effect of frequency of performance on automaticity, such that frequently performing a behaviour has a stronger effect on automaticity when the behaviour is experienced as rewarding (Judah et al., 2018; McCloskey & Johnson, 2019; Wiedemann et al., 2014). In line with these studies, our findings indicate that when participants associated no reward with drinking water, their motivation to perform this behaviour seemed low. It is therefore unlikely that these participants engaged in repeated performance of this behaviour, which could explain why these participants experienced water drinking as effortful and inconsistent. Importantly, the prevalence of reward and value among participants with high water intake that was self-reported as automatic suggests that water drinking 'habits' could be goal-driven behaviours that have become automatic to some degree (Kruglanski & Szumowska, 2020; Moors et al., 2017). In other words, our findings tentatively suggest that reward could be important for water drinking habit maintenance, not

just habit formation. However, more research on the role of reward in habit maintenance is needed.

Self-identity was associated with valuing water and experiencing it as rewarding for some, but not all participants with high and consistent water intake. Possibly, self-identity has limited impact on this behaviour, or alternatively, participants lacked awareness around how their self-identity informs their water drinking. Prior research on self-identity and food choice indicated that self-identity was a difficult construct for participants to understand (Bisogni et al., 2002). We found that aspects of self-identity such as health consciousness may be associated with high and consistent water drinking, but that this association was not as clear when other aspects of self-identity where prioritised, such as religious identities or motherhood. This is in line with prior studies indicating that self-identity predicts healthy eating intentions and behaviour (Canova et al., 2020; Carfora et al., 2016; McCarthy et al., 2017). Although this link is made tentatively, our data was also in line with Identity Based Motivation theory, which suggests that different aspects of self-identity can be activated in different situations, therefore the association between self-identity and behaviour can vary across situations (Oyserman, 2009). Evidence for Identity Based Motivation theory also illustrates that social identities can inform attitudes towards and the performance of health behaviours (Oyserman et al., 2007). Our findings indicate however, that the extent of social identities' association with water drinking may vary across individuals, as some viewed this as an individualistic behaviour.

Finally, for many participants, drinking patterns from early life persisted into adulthood, such that early life drinking behaviour was similar or identical to current drinking behaviour. This is in line with longitudinal research which shows that childhood dietary patterns remain relatively stable over time (Movassagh et al., 2017). However, our findings are also in line with longitudinal research indicating that people can develop healthier dietary

patterns over time (Walthouwer et al., 2014), given that some participants reported changing their water drinking behaviour. In addition, participants described how their parents' attitudes towards and performance of water drinking behaviour shaped their own current water intake. This aligns with research showing parents' attitudes and behaviours influencing child and adolescent performance of health behaviours such as healthy eating (Loth et al., 2016) and physical activity (Ornelas et al., 2007). These findings indicate the importance of early intervention when trying to increase water intake, for example through promoting a preference for the taste of water, and through forming water drinking habits during childhood.

An applied implication of this study is that existing interventions or health practitioners advising people to drink more water or educating people on hydration may create a sense of obligation, but not a sense of value or reward. Although this may motivate individual instances of water intake, if an individual does not experience reward as a result, it seems unlikely that this behaviour will be repeated consistently. Therefore, interventions should also try to increase the reward people associate with water drinking, by capitalizing on aspects of drinking behaviour that many people value highly. For example, if someone values taste and associates this reward with sugar-sweetened beverages, then intervention efforts that stage the change from sugar-sweetened beverages to plain water with an intermediate drink, such as flavoured water, may be more effective. Additionally, interventions could assess whether prolonged exposure to drinking water can increase liking as a way of improving the taste rewards associated with water drinking. Where this cannot be achieved, interventions could try to develop a rewarding health goal associated with water, such as aiming to reducing the frequency of dehydration symptoms. These health goals can then be primed in the moment, to override competing goals for other drinks (E. K. Papies, 2016). Our

findings also suggest that interventions could use self-identity informed goal-setting, which has been a successful approach with healthy eating behaviour (Dominick & Cole, 2020).

A key limitation of this study is that the findings are situated within the cultural context of the UK. Therefore, they may not generalise to other cultural contexts. Additionally, most of the participants were white women and therefore, these findings may not generalise to more diverse groups. Although the qualitative survey allowed for a large sample, it did not allow follow-up on responses regarding more complex topics like self-identity. Other methods that allow more in-depth qualitative data collection may also be needed to improve researchers' understanding. However, our qualitative approach allowed us to be open to unanticipated insights (e.g., the importance of reward), while still maintaining enough structure to assess predetermined areas of interest (i.e., self-identity).

In conclusion, this study provides an in-depth insight into the understudied but clinically important health behaviour of water drinking. Associating water drinking with valued rewarding outcomes seems necessary for attaining high, consistent and subjectively effortless water intake. To understand whether an individual sees drinking water as rewarding, we need to understand which outcomes of drinking behaviour people value, and whether water can help attain these outcomes. Although education on the importance of hydration is important, health interventions and practitioners need to go further and allow people to experience water drinking as inherently rewarding. Healthy hydration habits are unlikely to result from recommendations to increase water intake alone, as our findings suggest experiencing reward is important for habit formation and maintenance.

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Authors' contributions: AR collected and analysed the data with guidance from EP. AR wrote the initial draft and then AR and EP redrafted, reviewed, and edited the manuscript.

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Table 1. Quantitative Survey Questions

Variable	Questions	Note
Water intake (ml)	What glass or bottle do you use most often to drink plain water on a typical day? 450ml glass, 250ml glass, 500ml bottle, 750ml bottle How many of the glasses or bottles that you chose above do you drink on a typical day?	We multiplied these two responses to calculate water intake
Water intake frequency (instances per week)	How many days do you drink water, in a typical week? How many times during each of those days do you drink water, on average?	We multiplied these two responses to calculate water intake frequency
Number of water drinking situations	Please select all the situations where you regularly drink water from the list below, e.g., "when you are thirsty", "during mealtimes".	
Automaticity	Participants indicated how much they agreed with four statements adapted from the Self-Report Behavioural Automaticity Index (Gardner et al., 2012) such as "Drinking water is something I do automatically, 0, strongly agree – 100, disagree."	We calculated the average of the 4 responses to get an automaticity score
Perception of ease of drinking water	How easy or difficult is it for you to drink water during your day-to-day life? 0, very difficult – 100, very easy	
Perception of knowledge	How much knowledge do you have on why drinking water is important? 0, none at all – 100, expert knowledge	
Urine Colour	What colour is your urine most often, on a typical day? See Figure 1	
Frequency of dehydration symptoms	How often do you experience i.e., dry mouth, headache, fatigue, irritability, light-headedness? 0, rarely – 100, most of the time	

Table 2. Qualitative Survey Questions

Question	Note
What does being 'a real water drinker' mean to you?	Only "real water drinker - Yes" participants
Why do you not think that you are 'a real water drinker'?	Only "real water drinker - No" participants
How would you describe the kind of water drinker you are? Please explain why you describe yourself in this way	Only "real water drinker - No" participants

What role does drinking water play in your day-to-day life? Has it always been this way for you? If not, please provide an example of a time this has changed.	
Why do you think drinking water came to have this role in your day-to-day life?	
Please walk us through your day (morning to evening) and describe everything you drink (i.e., what and how much) in each situation. Please also explain why you drink each drink. Whatever you are drinking during the day is of interest to us, we truly want to understand your daily drink choices.	
How does drinking water day-to-day fit in with who you are as a person?	
Think about drinking water in your normal day-to-day life. Please explain how easy or hard it is for you to drink water. Please also explain why you think this is the case.	
Can you tell us about situations where you choose not to drink water, or situations where you are not able to drink water? Does this have any impact on you? Please outline the situation(s) and explain why you do or do not feel impacted by this.	
Please tell us about the effect (if any) that thinking about yourself as 'a real water drinker' has on your day-to-day water drinking.	Only "real water drinker - Yes" participants
You previously described the kind of water drinker you are. Please think about the description you gave and tell us about the effect (if any) that thinking about yourself in this way has on your day-to-day water drinking.	Only "real water drinker - No" participants
Think about drinking water in situations outside of your normal day-to-day life. Please explain how easy or hard it is for you to drink water. Please also explain why you think this is the case	
Think of a time when your daily routine changed considerably (i.e. change in education, work or home environment). Did your water drinking behaviour change because of this? Please outline the change you experienced and explain why your water drinking changed or why it did not.	
Give an example of a time you experienced people mentioning your water drinking? Please explain the effect (if any) these comments had on your behaviour. If you have not experienced this, what do you think other people in your life think about your water drinking? Please explain the effect (if any) this has on your behaviour	

Table 3. Word Count Descriptives for Responses per Qualitative Survey

	"Real water drinker - No"	"Real water drinker - Yes"
Min Words	162	200

Max Words	984	948
Average Words	456	454
Total Words	22,792	23,611

Table 4. Examples of Quality Low and High Word Count Responses

Question	Response	Interpretation*	Word Count
Give an example of a time you experienced people mentioning your water drinking? Please explain the effect (if any) these comments had on your behaviour. If you have not experienced this, what do you think other people in your life think about your water drinking? Please explain the effect (if any) this has on your behaviour	"I don't think anyone has really commented on it." [P11]	Both quotes, regardless of word count, provided evidence to support the narrative we present in Theme 3 on whether water drinking was linked to participants' identities as part of their social groups.	10
	"my sister drinks quite a lot of water, and she actually pointed out to me that I don't drink enough. since then, I have made an effort to drink more water, and often remind myself to be more like her in that sense. I think people have pointed out how much coffee I drink rather than pointing out my lack of water drinking, but I think it has had a similar effect, as it has made me more aware of the beverages I choose to consume, and therefore reminded me that I need to drink more water." [P30]		98
Why do you think drinking water came to	"My Nana taught me the importance of hydration" [P2]	Both quotes, regardless of	9

have this role in your day-to-day life?	"I've never really liked soft or fizzy drinks, squashes and pure juices - I find most nonalcoholic drinks like this way too sweet. I never drank very sugary drinks when I was growing up as I never had the taste for them. I much preferred milk or water. After I realised how water was necessary for good health it was easy to switch to drinking more because I like the taste and I'm quite cheap so I like free liquids, and I wanted to decrease my dairy consumption. However as an adult I also drink tea, coffee and alcohol, although I prefer non-sweetened versions of all of these. I also have to take quite a few medications every day for health reasons, so am used to having a glass in the morning with these, and I get migraines and headaches so tend to try and stick to just water when I have these attacks." [P29]	word count, provided evidence to support the narrative we present in Theme 4 on the features of early life that seemed to influence present day water drinking patterns.

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*These quotes did not provide sufficient evidence for our interpretation when viewed on their own. Only when these quotes were viewed in relation to other relevant quotes across the entire dataset did they support our interpretations.

Demographics			
		Range	***M (SD)***
Age (years)		18 - 72	24 (12)
		Count	**%**
Gender:			
	Female	293	73.25
	Male	106	26.5
	Prefer not to say	1	0.25
Employment:			
	Full-Time	179	44.75
	Part-Time	87	21.75

Due to start a new job within the next month	3	0.75
Not in paid work (e.g., homemaker', 'retired or disabled)	44	11.00
Unemployed (and job seeking)	41	10.25
Other	33	8.25
Prefer not to say	13	3.25
Student Status:		
Yes	85	21.25
No	311	77.75
Prefer not to say	4	1.00
Nationality:		
United Kingdom	338	84.50
Ireland	5	1.25
Poland	5	1.25
Australia	3	0.75
France	3	0.75
India	3	0.75
Italy	3	0.75
Brazil	2	0.50
Germany	2	0.50
Hungary	2	0.50
Japan	2	0.50
Lithuania	2	0.50
Mexico	2	0.50
Nigeria	2	0.50
Portugal	2	0.50
South Africa	2	0.50
Sri Lanka	2	0.50
United States	2	0.50
Venezuela, Bolivarian Republic of	1	0.25
Austria	1	0.25
Bulgaria	1	0.25
Canada	1	0.25
Dominica	1	0.25
Finland	1	0.25
Greece	1	0.25
Iran	1	0.25
Malaysia	1	0.25
New Zealand	1	0.25
Pakistan	1	0.25
Palestinian Territory	1	0.25
Philippines	1	0.25

Qatar	1	0.25
Romania	1	0.25
Spain	1	0.25
Prefer not to say	2	0.50

Note: All demographics presented are the standard demographics held by the online participant recruitment platform Prolific (www.prolific.co)

Table 6. Qualitative Survey Participant Demographics

Demographics		
	Range	***M (SD)***
Age (years)	18 - 69	33 (11)
	Count	**%**
Gender:		
Female	75	74.26
Woman	1	0.99
Male	24	23.76
Male (transgender)	1	0.99
Employment Status:		
Full-time	75	74.26
Part-time	1	0.99
Unemployed	6	5.94
Student	13	12.87
Homemaker	6	5.94
Ethnicity:		
White	39	38.61
White - British/Scottish/English/Irish/European	33	32.67
British/Scottish	7	6.93
Asian	4	3.96
Indian	2	1.98
Mixed	2	1.98
Chinese	1	0.99
African Caribbean	1	0.99
Black African	1	0.99
British - Asian/Indian	1	0.99
British Bengali	1	0.99
Caucasian	1	0.99
White - Finnish	1	0.99
Greek	1	0.99
Japanese	1	0.99
Middle Eastern	1	0.99

Other white background	1	0.99
Pakistani	1	0.99
Sri Lankan Asian	1	0.99
NA	1	0.99

Note: All demographics presented were asked as open-ended questions as part of the qualitative survey

Table 7. Quantitative Data Analysis Overview

Dependent Variable	Type of Data	Model used to test difference between groups*
Intake Amount (ml)	Continuous	Simple linear regression (with unequal variance)
Intake Frequency (instances per week)	Continuous	Simple linear regression (with unequal variance)
Number of Situations	Ordinal	Cumulative link model
Automaticity	Continuous	Simple linear regression
Perception of Ease	Continuous	Simple linear regression
Perception of Knowledge	Continuous	Simple linear regression
Urine Colour	Ordinal	Cumulative link model
Frequency of Dehydration Symptoms	Continuous	Linear regression

Note: All models were up with the same formula format Dependent Variable ~ Group (i.e., "real water drinker - yes" vs “real water drinker - no")
*Simple linear regression is equivalent to a t-test

Table 8. Quantitative Data Descriptives

Dependent Variable	“Yes” - "real water drinker"			“No” - "real water drinker"		
	M	*SD*	n	*M*	*SD*	n
Intake Amount (ml)	1717.56	862.63	252	843.6	569.76	125
Intake Frequency (instances per week)	52	39	256	23	26	129
Automaticity	68.32	23.39	258	37.66	24.26	132
Perception of Ease	83	19	267	60	28	133
Perception of Knowledge	72	15	265	66	17	130

Frequency of Dehydration Symptoms	38.31	17.98	261	49.58	18.88	123
	Median	Range	n	*Median*	Range	n
Number of Situations	7	1 - 15	267	4	1 - 14	133
Urine Colour	3 (urine colour chart, f)	1-7 (h-b)	259	4 (urine colour chart, e)	1-8 (h-a)	132

Note. Automaticity, Ease, Knowledge, and Frequency of dehydration symptoms scales ranged from 0-100

Table 9. Quantitative Data Analysis Overview

Dependent Variable	**Effect of Group**	**95% CI**	**Hypothesis Test**	**Significance***
Intake Amount (ml)	873.96	727.97 - 1019.95	t(345.58) = 11.73, p = 1.58e-27	Significant
Intake Frequency (instances per week)	29	23 - 36	t(350.34) = 8.8, p = 6.53e-17	Significant
Number of Situations	1.64**	1.25 - 2.03	LRT(397) = 71.74, p = 2.45e-17	Significant
Automaticity	30.67	25.68 - 35.65	t(388) = 12.10, p = 8.16e-29	Significant
Perception of Ease	23.27	18.59 - 27.95	t(398) = 9.78 p = 2.23e-20	Significant
Perception of Knowledge	6.55	3.26 - 9.84	t(393) = 3.91 p = 0.0001	Significant however, this effect size may not be relevant given our pre-registered smallest effect size of interest (i.e., 10 points)
Urine Colour	1.46**	1.07 - 1.86	LRT(386) = 54.46, p =1.58e-13	Significant
Frequency of Dehydration Symptoms	-11.28	(-15.21) - (-7.35)	t(382) = -5.64, p = 3.27e-8	Significant however, this effect size may not be relevant given our pre-registered smallest effect size of interest (i.e., 10 points)

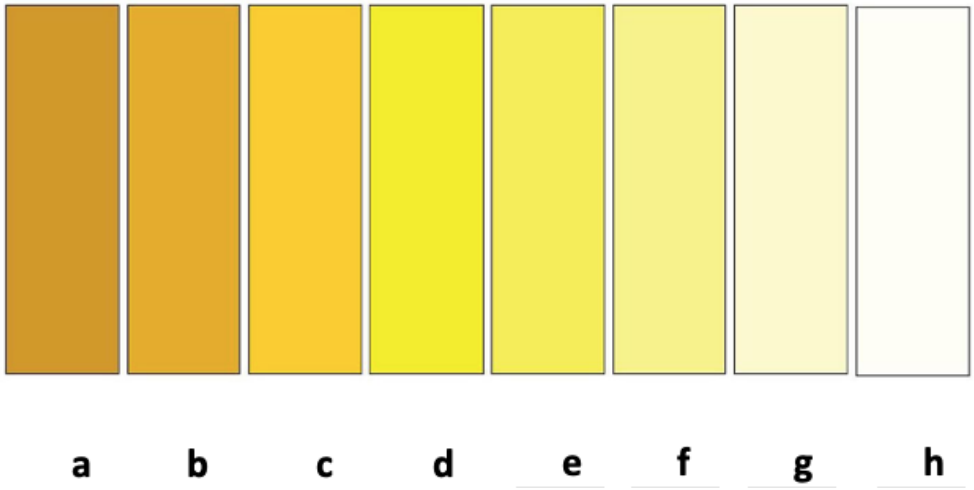
*A significant result is interpreted as meaning the data observed is unlikely assuming the null hypothesis is true, the cut-off was <0.00125

**These effects are logits. To get the odds reported in the main text you take the exponent of these effects.

Table 10. Overview of the Narrative of the Qualitative Themes

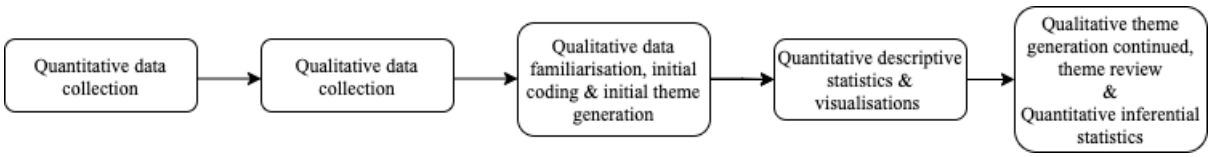
Theme Name	Summary
Theme 1: “I don't just drink water for the sake of it” – Drinking Water with a Sense of Value	Participants who drank high and consistent amounts of water seemed to value water drinking. They also experienced rewarding outcomes when they drank water, and sometimes adverse outcomes when they did not. From these participants’ perspectives, reward was a salient motivation for drinking water during the day. For these participants, water was also an easy and accessible default choice in most situations. These participants described performing their water intake and preparation behaviours with automaticity, indicating that these behaviours could be habitual.
Theme 2: “I don't drink it because I enjoy it, I just know I should” - Drinking Water out of Obligation	Participants with low and inconsistent intake seemed to feel obligated to drink water, but did not seem to value water. They seemed to experience no reward when they drank water, nor adverse outcomes when they did not. From these participants’ perspectives, the lack of reward was a salient reason why they lacked motivation to drink water during the day. Because they found drinking water unbeneficial, unenjoyable and effortful, but they found drinking other drinks beneficial, enjoyable, and effortless, it is not surprising that these participants drank water infrequently.
Theme 3: Self-Identity and Water Drinking Behaviour	The impact of self-identity on participants valuing water drinking seemed complex. Some aspects of self-identity, such as health-consciousness, seemed to align with participants valuing water drinking and experiencing reward from this behaviour. However, in situations where other aspects of self-identity were prioritised, this association was not as clear. Additionally, water drinking only seemed to be related to social identity for those individuals who perceived water drinking having a social signalling function, and not for others who perceived water drinking as individualistic. Finally, self-identity did not seem to be a salient motivation of water drinking behaviour for all participants with high intake.
Theme 4: “It has always been this way for me” – The Persistence of Drinking Patterns from Early Life	Drinking patterns from early life seemed to persist into many participants’ adult lives. The drinking patterns these participants had growing up were often identical or very similar to their current drinking patterns. Even when there were attempts to change drinking patters in later life, this seemed harder when early patterns were deeply engrained.

Figure 1
Urine Colour Chart



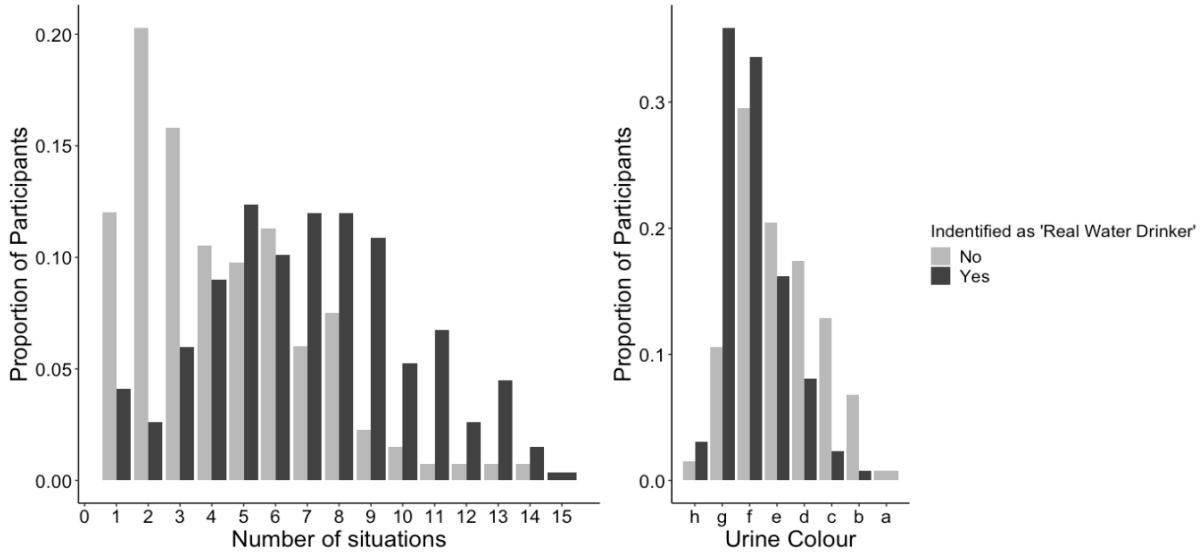
Note. Based on Armstrong and colleagues (Armstrong et al., 1994), with added letters to indicate response options.

Figure 2
Study Method Process Diagram



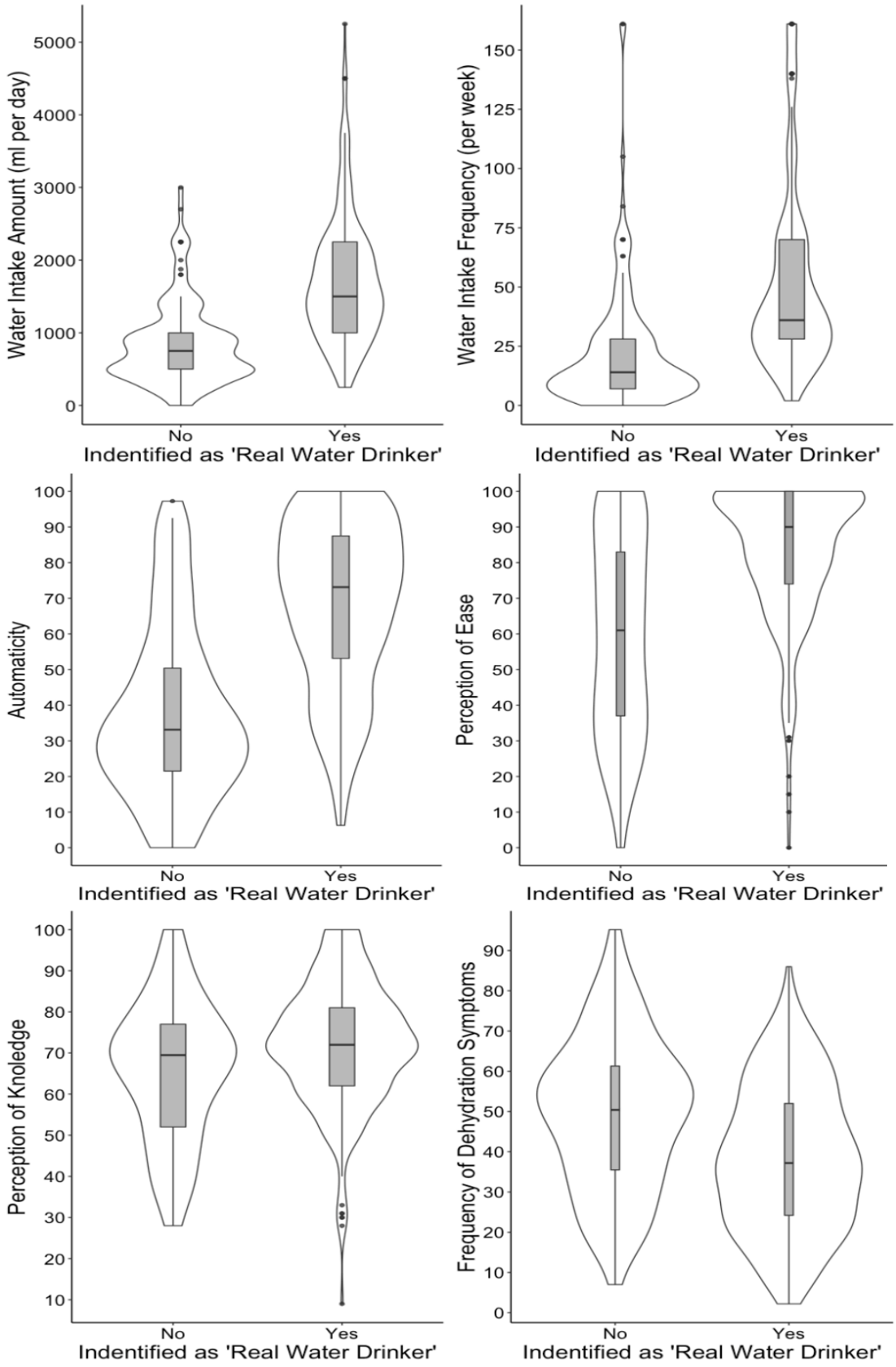
Note. This diagram illustrates the timing of the research activities conducted by the researchers.

Figure 4
Histograms of ordinal dependent variables



Note. The plot grid shows the proportion of participants that reported each number of situations (Hyp. 3) and urine colour (Hyp. 7) per group

Figure 3.
Violin, Boxplots of Continuous Dependent Variables



Note. The plot grid shows the mirrored continuous distribution and boxplot of self-reported water intake amount (Hyp. 1), water intake frequency (Hyp. 2), automaticity (Hyp. 4), perception of ease (Hyp. 5), perception of knowledge (Hyp. 6) and frequency of dehydration symptoms (Hyp. 8) per group. Given the difference in intake and frequency in the analyses for Hyp 1 and 2, the group of 'real water drinkers' are referred to as "high water drinkers" and the other group are referred to as "low water drinkers". The boxplot shows the median of each group with lower and upper hinges representing the first and third quartiles respectively. The whiskers represent values 1.5 times the interquartile range away from their respective hinge and the dots represent data points beyond this threshold.