Impact of Graduated Markers on Water Intake of Office Workers in Delhi

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Abstract

Hydration is essential for health, yet many individuals struggle to meet the recommended daily intake . This study addresses the gap in understanding how motivational design elements, specifically graduated markers on water bottles, influence hydration habits. The aim was to assess whether bottles with graduated markers could improve water consumption more effectively than plain bottles. Over a 16-17 day period, 23 office workers participated in the study. participants using marked bottles showed significantly higher water intake compared to those using plain bottles, regardless of age. However, after 10 days the rate of water intake begins to decline as participants are more accustomed to the water bottle. These findings indicate that incorporating motivational design features into hydration products can effectively improve water consumption among consumers, accordingly, it provides valuable insights to producers of such products.

Introduction

Water is a fundamental component of all living organisms and plays a crucial role in maintaining various bodily functions.

60%

Of the human body is comprised of water.
It is essential for numerous physiological processes. [2]

It aids in eliminating waste products through urine and sweat, facilitates the transfer of nutrients and oxygen to cells, and helps regulate body temperature through perspiration. Despite its vital role, many people often neglect the importance of adequate water intake, which can lead to dehydration and related health issues. [1]

Proper water consumption is crucial for maintaining optimal health and well-being. It supports several key functions:

1. aiding in the elimination of toxins and waste products, primarily through the kidneys, thus helping to prevent urinary tract infections and kidney stones
2. assisting in the transport of nutrients and oxygen to cells, ensuring efficient bodily functions
3. regulating body temperature by enabling the cooling effect of sweating and evaporation.

Adequate hydration also enhances cognitive functions, such as concentration and memory, and supports physical performance by maintaining endurance and strength. In summary, drinking enough water is essential for preventing health problems like fatigue, headaches, and impaired cognitive function, while also optimizing physical performance and overall well-being. [3]

Literature Review

A study by Chen and Castleman, conducted in 2023, examined the impact of motivational design elements on water consumption among college students. The study involved a sample size of students using smart water bottles and analyzed their daily water intake and health status over a 35-day period. The findings revealed that the smart bottles did not significantly increase water consumption or improve health outcomes, suggesting that factors such as lifestyle preferences and social influences may diminish the effectiveness of such devices in this demographic. [4]

A study by Tommy et al., conducted in 2017, investigated the effectiveness of an interactive water bottle application on a smartphone to enhance user water consumption. The study focused on the Smart Bottle project, which integrates a water bottle with an Android application providing real-time data on water consumption. [5]

A study by Pryor et al., conducted in 2020, investigated the impact of water consumption bolus volume and frequency on hydration biomarkers during work in a hot environment. The study involved eight male participants who consumed either 500 mL of water every 40 minutes or 237 mL of water every 20 minutes during 2 hours of continuous walking in a 34 °C/30% relative humidity environment, followed by 2 hours of rest. The findings revealed no significant differences in body mass, plasma volume, plasma osmolality, thirst, or gastrointestinal symptoms between the two hydration strategies. [6]

Knowledge Gap and Rationale

Knowledge Gap

Despite the known benefits of hydration, significant knowledge gaps remain regarding effective strategies to promote adequate water intake. There is limited research on the comparative effectiveness of different types of water bottles (e.g., marked vs. unmarked) in encouraging hydration habits. More research is needed to understand how different demographic variables affect hydration habits.

Rationale

Chronic dehydration can lead to various health problems, such as fatigue, headaches, kidney stones, and impaired cognitive function. It is important to study and investigate the effects of a marked water bottle in order to promote hydration and prevent health problems, Moreover, This research provides water bottle manufactures with empirical evidence, which shows the effectiveness of marked water bottle, further allows them to alter their designs and prices accordingly. Furthermore, the design of water bottles can significantly impact hydration habits. Bottles equipped with visual indicators can encourage more frequent and adequate drinking by allowing individuals to monitor their hydration levels throughout the day.

Methodology

Research Objectives

The study has the following specific objectives:

- To understand the impact of novelty on water consumption habits of the respondent group.
- To understand the longevity of novelty in water consumption.
- To analyse the impact of product design (graduated/motivation markers) on water consumption habits of male office workers in Delhi NCR during summers.
- To examine the role of age in the above-mentioned relationship.

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Research Hypotheses

The study has the following null hypotheses:

- H_{01}: There is no significant difference in the pre and post water consumption of the group.
- H_{02}: There is no significant difference in the consumption from the new water bottle in the first 10 days and the next 7 days.
- H_{03}: There is no significant difference in the improvement in water consumption on the basis of water bottle allotted.
- H_{04}: There is no significant difference in the improvement in water consumption on the basis of age.

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SAMPLING AND SAMPLE CHARACTERISTICS

- Initially 26 respondents were included in the study working in the Sara products private limited wherein their demographic information like age, gender, smoking habits was collected through a google form.

- Post that 3 respondents were excluded from the study on the basis of gender and smoking habits to finally achieve a sample of 23 male non-smokers in the age range of 16 to 68 years old.

- Participants were arranged in an ascending order according to age and were then assigned marked and plain bottles in an alternating order. This ensured that we ended up with two groups:

EXPERIMENTAL GROUPS

Group A: 13 people were assigned standard 1 litre plain bottles without any markings. Out of these, 6 people were 40 and under and 7 were over 40 years of age.

Group B: 10 people were assigned standard 1 litre bottles with graduated/motivation markings indicating the volume of water consumed. Out of these 5 people were 40 and under and 5 were over 40 years of age.

STUDY ENVIRONMENT

- The study was conducted in office environment in the month of July.
- Participants were instructed to use the assigned water bottles in their workplace as well as at home throughout the study period, i.e., for 15 continuous days.

DATA COLLECTION PROCEDURE

- Respondents were instructed to fill their daily water consumption every day at 9 PM for 15 days through a google form.
- Daily surveys were administered to collect data on water intake, frequency of drinking, and subjective feelings of hydration.
- Participants were also asked about their overall experience using the water bottles, including ease of use, convenience, and any noticeable changes in hydration habits

DATA ANALYSIS TECHNIQUE

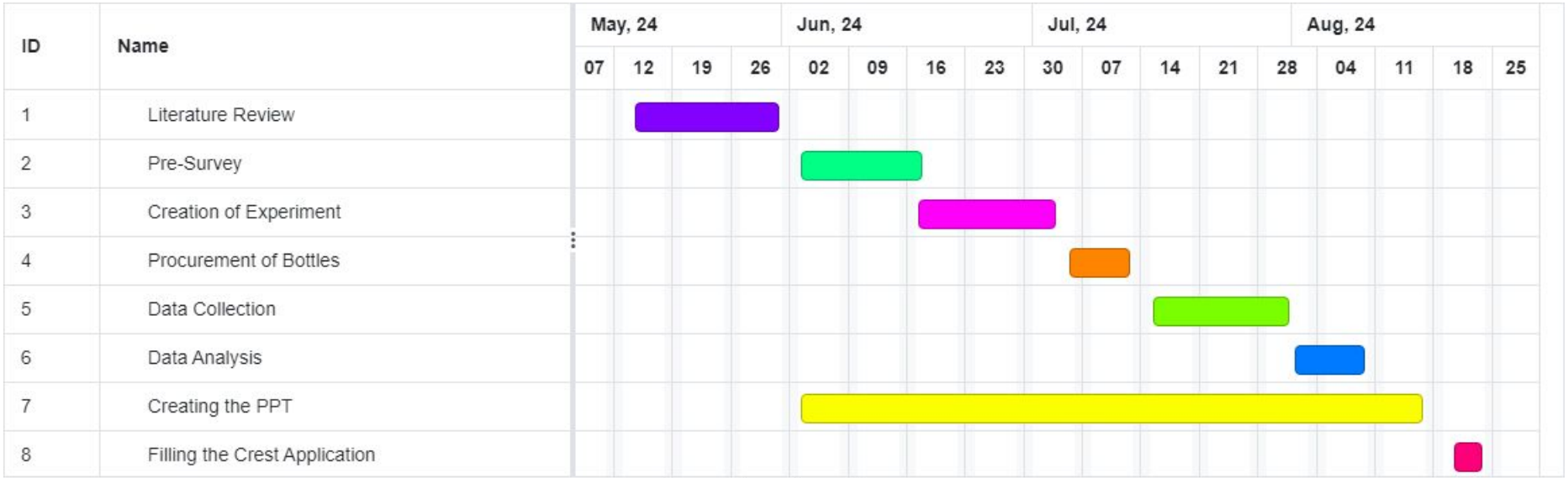
- The study employs statistical tests like paired and independent t-tests to understand pre-post differences as well as the differences in the two groups respectively.
- This was done through Datatab.

ETHICS AND INFORMED CONSENT

Informed consent was taken from all the survey participants in the following manner:

- The purpose of the study was clearly mentioned to the participants through google form description.
- Consent was taken through the same mode.
- Confidentiality and anonymity was maintained throughout the study.
- The information received by each respondent was not shared or misused in any fashion.

Time Management



Results & Discussion

Table 1: Paired t-test analysis of Water Consumption Generally and After using the New Bottle (N=23)

	N	Mean	SD	t	p
General Consumption	23	2.68	0.85	-5.38	<0.001***
New Consumption	23	3.03	0.76		

Note: *p<0.10, **p<0.05, ***p<0.01

It can be seen that there is a significant difference between the normal water consumption of the participants and there water consumption after using the new bottles assigned to them ($t(21)=-5.38$, $p<0.01$). This is an overall finding regardless of the kind of bottle assigned. Therefore, H_{01} has been rejected. This means that novelty in the mode of consumption has a positive effect on water intake habits for the first 15 days.

Discussion

One possible explanation for this could be that the increase may have been caused by the psychological effects of using a new bottle. The introduction of a new object into one's life leads to the release of dopamine, causing excitement and happiness, marking changes in behaviour [7]. Participants may have been more conscious of their hydration practices during the experiment, making an effort to reach daily goals either intentionally or unintentionally. This increased awareness may have had a major impact on water consumption during the course of the experiment. It has been found in literature that the novelty of a new item leads to greater engagement with it and hence explains the increase in consumption as a whole [8].

Table 2: Paired t-test analysis of Water Consumption in the first 10 days and the next 7 days (N=23)

	N	Mean	SD	t	p
Consumption in the first 10 days	23	3.2	0.78	5.02	<0.001***
Consumption in the next 7 days	23	2.77	0.8		

Note: *p<0.10, **p<0.05, ***p<0.01

It can be seen that there is a significant difference between the water consumption from the newly assigned bottle for the initial 10 days of the experiment, post which the consumption declines significantly ($t(21)=5.02$, $p<0.01$). This essentially shows that increase in consumption is being driven by the novelty factor of new bottle, which eventually fades away after 10 days. Hence, H_{02} is rejected.

Discussion

The reason for the downward trendline of water consumption from the newly assigned bottles, can be explained by the phenomenon of ‘habituation’. When individuals encounter something novel, the brain's reward system is activated, releasing dopamine, which reinforces the behavior of seeking out new experiences. This process leads to greater engagement or usage. However, with repeated exposure to the same stimulus, the brain tends to habituate, reducing the emotional response and excitement associated with it. This habituation explains why the initial thrill of a new purchase or experience often diminishes over time, leading to a cycle where individuals continuously seek new stimuli to regain that excitement. [9, 10, 11, 12]

Table 3: Independent t-test analysis of Increase in Water Consumption on the basis of Assigned Bottle (N=23)

	N	Mean	SD	t	p
Marked	10	0.56	0.17	3.94	0.001***
Plain	13	0.18	0.29		

Note: *p<0.10, **p<0.05, ***p<0.01

It can be seen that the increase in water consumption from the marked bottle is significantly more than the increase in water intake from the plain water bottle ($t(21)= 3.94, . p<0.01$). This shows that graduated motivation markers on water bottles are significantly more effective in improving water intake habits. Therefore, design plays an important role in consumer goods. Hence, H_{03} is rejected.

Discussion

Motivational markers on water bottles serve as an effective intervention to promote consistent hydration by leveraging psychological principles such as visual cues, progress tracking, and positive reinforcement [13]. The time-based indicators and motivational phrases act as salient visual stimuli, prompting individuals to consume water at regular intervals. The measurement markings facilitate the monitoring of daily water intake, thereby enhancing self-regulation and adherence to hydration goals. This structured approach to hydration introduces a gamified element, wherein the completion of the bottle by the end of the day is perceived as an attainable challenge, reinforcing the behavior through a sense of achievement. Moreover, the incorporation of motivational messages provides ongoing positive reinforcement, further embedding the behavior into the individual's daily routine. The convergence of these factors contributes to the formation and maintenance of a hydration habit, underscoring the utility of motivational water bottles as a tool for enhancing water consumption in a sustained and psychologically engaging manner [14].

Table 4: Independent t-test analysis of Increase in Water Consumption on the basis of Age (N=23)

	N	Mean	SD	t	p
40 and Under	11	0.41	0.35	1.03	0.316
Above 40	12	0.28	0.26		

Note: *p<0.10, **p<0.05, ***p<0.01

It can be seen that there is no significant difference in the increase in water consumption between participants above the age of 40 and below the age of 40, regardless of the assigned water bottle ($t(21)=1.03$, $p>0.05$). This indicates that during the experiment younger and older participants were able to improve their water consumption at a similar level. Hence, H_{04} is retained.

Discussion

The lack of significant difference in water consumption increases between younger and older participants can be explained by several factors highlighted in existing research. For example, a study on total water intake among older adults found that while water consumption tends to decrease with age, the motivations for hydration, such as health awareness, can equally influence both younger and older individuals [15]. Therefore, interventions promoting water intake may be effective across age groups if they align with participants' health goals. Moreover, research on interventions aimed at increasing water consumption among children indicates that lifestyle changes can lead to modest yet significant improvements in hydration, regardless of age [16]. Thus, effective strategies can transcend age differences, allowing both younger and older participants to enhance their water intake similarly.

Conclusion

Implications of the Study

The findings of this study indicate that the use of water bottles with graduated markers can increase water consumption in the short term, regardless of the age of the user. This study suggests that individuals, aiming to improve their hydrations habits can use such water bottles to yield better health outcomes, particularly, preventing dehydration and eventually improving their water consumption habits. This can be particularly beneficial for those who struggle with maintaining adequate hydration, such as athletes, the elderly, and individuals with busy lifestyles. By making it easier to monitor and achieve daily hydration goals, these bottles can lead to better overall health outcomes, including improved physical performance, cognitive function, and skin health. Moreover, for companies designing and producing consumer goods, especially in the health and wellness sector, this study highlights the importance of incorporating motivation markers in their design, in order to cater to the needs of health conscious consumers. Designers can leverage this research to innovate and create products that resonate with health-conscious consumers. For example, incorporating customizable marker designs or interactive features that track and encourage hydration can appeal to a broader audience. Additionally, Companies may use this study to provide empirical evidence in their marketing campaigns, in the form of ethos, to further expand their consumer base .

Limitations of the Study

1. **Sample Size and Demographic Diversity:** The findings may be limited in generalizability if the sample was not sufficiently diverse or large, potentially affecting broader applicability.

2. **Short Duration:** The study's brief duration may not capture the long-term effects of using marked water bottles on hydration habits, indicating the need for extended research.

3. **Self-Reported Data:** Reliance on self-reported data could lead to inaccuracies, as participants might overestimate or underestimate their actual water intake.

References

1. N. Silver, “Why is water important? 16 reasons to drink up,” *Healthline*, Apr. 12, 2023. https://www.healthline.com/health/food-nutrition/why-is-water-important#toxins
2. “The water in you: water and the human body | U.S. Geological Survey,” Oct. 22, 2019. https://www.usgs.gov/special-topics/water-science-school/science/water-you-water-and-human-body#:~:text=Up%20to%2060%25%20of%20the,bones%20are%20watery%3A%2031%25
3. J. McIntosh, “Fifteen benefits of drinking water,” Dec. 21, 2023. https://www.medicalnewstoday.com/articles/290814#benefits
4. Y. Chen and F. Castleman, “Effects of smart bottles on water consumption and health status of college students,” International Journal of Physical Education Fitness and Sports, pp. 84–91, Sep. 2023, doi: 10.54392/ijpefs2338.
5. R. Tommy, V. Raja V., and A. S. Krishna, “Interactive water bottle application on a smart phone to enhance user water consumption,” 2017. https://www.semanticscholar.org/paper/Interactive-Water-Bottle-Application-on-a-Smart-to-Tommy-V.Raja./164226edbd5d4bd63ef9b0ccd71e92d65a545687
6. R. R. Pryor, J. R. Larson, L. W. Vandermark, B. D. Johnson, and Z. J. Schlader, “Water consumption patterns impact hydration markers in males working in accordance with the National Institute for Occupational Safety and Health recommendations,” Journal of Occupational and Environmental Hygiene, vol. 20, no. 9, pp. 414–425, Jul. 2023, doi: 10.1080/15459624.2023.2221713.
7. N. Bunzeck and E. Düzel, “Absolute coding of stimulus novelty in the human substantia Nigra/VTA,” Neuron, vol. 51, no. 3, pp. 369–379, Aug. 2006, doi: 10.1016/j.neuron.2006.06.021.
8. Emotion Typology, “Excitement - emotion typology,” Emotion Typology, Mar. 13, 2022. https://emotiontypology.com/positive_emotion/excitement/
9. T. Minimalist, “The desire to acquire: Why the novelty of buying new things soon wears off,” Theoretical Minimalist, Jan. 17, 2024. https://www.theoreticalminimalist.com/the-desire-to-acquire-why-the-novelty-of-buying-new-things-soon-wears-off/
10. “Habituation: Why does the initial excitement always wear off?,” www.MentalHelp.net. https://www.mentalhelp.net/blogs/habituation-why-does-the-initial-excitement-always-wear-off/
11. Allan, “How do we keep the novelty of new things from wearing off?,” What Is Stoicism?, Oct. 22, 2021. https://whatisstoicism.com/stoicism-resources/how-do-we-keep-the-novelty-of-new-things-from-wearing-off/
12. D. O’Leary, “When the new wears off,” The Cadence of My Soul, Aug. 19, 2014. https://cadenceofmysoul.com/2014/08/18/when-the-new-wears-off/
13. B. Wansink, J. E. Painter, and J. North, “Bottomless Bowls: Why visual cues of portion size may influence intake**,” Obesity Research, vol. 13, no. 1, pp. 93–100, Jan. 2005, doi: 10.1038/oby.2005.12.
14. D. Dream, “The Motivation Bottle: How it can help you achieve your healthy lifestyle goals | DrinkDream.eu,” Drink Dream, Jul. 15, 2023. [Online]. Available: https://drinkdream.eu/en/motivation-bottle-how-it-will-help-you-achieve-your-healthy-lifestyle-goals-2/
15. C. B. Franse, M. Boelens, L. R. Fries, F. Constant, A. Van Grieken, and H. Raat, “Interventions to increase the consumption of water among children: A systematic review and meta-analysis,” Obesity Reviews, vol. 21, no. 7, Mar. 2020, doi: 10.1111/obr.13015.
16. C. A. Zizza, K. J. Ellison, and C. M. Wernette, “Total water intakes of Community-Living Middle-Old and Oldest-Old adults,” The Journals of Gerontology Series A, vol. 64A, no. 4, pp. 481–486, Feb. 2009, doi: 10.1093/gerona/gln045.