



## Original Article

### The Role of Age, Education and Impulsivity in Water Consumption; the Importance of Personality Traits in Correcting Patterns of Water Consumption by Designing Sustainable Products

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#### Abstract

**Objective:** The water crisis is one of the main challenges facing humanity, especially in countries with low rainfall, such as Iran. It has been shown that socio-cultural factors can affect the patterns of water consumption among households. In this study, we aimed to evaluate the relationship between three factors, i.e. impulsivity, monthly income and educational level on water consumption in Urmia urban class families.

**Materials and Methods:** 21 urban households were selected based on cluster sampling and their average monthly water consumption, education level, and monthly income was measured. Furthermore, the average impulsivity of each family was evaluated using the Barratt impulsivity scale 11 (BIS-11). In order to investigate the relationship between water consumption and educational level, income and impulsivity, Pearson correlation coefficient and the significance level of 0.05 were used.

**Results:** The total average monthly income of the families was 1,739,705.88±429904.43 Tomans. All participants were literate. The total average water consumption was 157.10±32.24 liters of water per person. The total mean score of the BIS-11 was 50.62±6.72. Correlation analysis showed a significant positive relationship between water consumption and impulsivity.

**Conclusions:** The results of this study show the importance of education in changing the pattern of water consumption as well as considering the behavioral characteristics in the education process and designing products for optimal water consumption.

**Keywords:** Water Consumption, Education Level, Monthly Income, Impulsivity, Product Design

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#### Introduction

The water crisis is one of the main challenges facing humanity, and according to the World Economic Forum in 2015, the water crisis is at the top of the list of the world's largest threats [1]. Iran is located in one of the driest regions of the world with an average annual rainfall of 252 mm, one-third of the global average, and is on the verge of a serious water crisis [2]. 550 cities in Iran, more than half the cities of the country, face a state of water tension or official warning, which well describes the depth of the water crisis in Iran [3].

It is estimated that in the near future, more than 70% of the population of Iran has to leave their place of residence [4]. Meanwhile, the drought crisis in Urmia Lake has become one of the current alarm waves of the water crisis in Iran and is among the

priorities of the government. Reports indicate that the human factor is leading reason of drought crisis in Urmia Lake, and unsustainable consumption of rural and urban water in the catchment area of the lake is the biggest challenge facing the lake instauration [3].

The need to modify patterns of water consumption and change the behavior of users towards sustainable behaviors is not just about Iran and is one of the central concerns of water management in the world today [5]. Designing products to overcome the widespread disinformation of users in the context of the water crisis as well as the rectification of unsustainable water consumption in urban areas is one of the most important ways to achieve sustainable development [5].

Meanwhile, it has been shown that socio-cultural factors can affect the patterns of water consumption among households.

For example, Yazdandad et al. (2009) showed that education level, occupational position, as well as water price and seasonal changes may contribute to water consumption pattern [6]. Additionally, Shahabadi et al. (2013) showed that international media, place of birth, religious believes, number of household members and lifestyle are also among the variables that explain 30% of changes in patterns of water consumption [7]. Moreover, the role of behavioral characteristics in water consumption should not be ignored.

Impulsivity and inability to control behaviors are among the behavioral factors that may seem to affect water consumption behaviors. Barratt recognized impulsivity as a kind of behavior characterized by quick cognitive decision-making without thinking and orientation towards future [8]. Increasing evidence suggesting that impulse individuals usually do not think about the outcome of their behaviors. Impulsive people usually eat more and are more exposed to obesity than others [9], deal without regard to their financial situation [10], and have problems in adjusting their affections and emotions to others and the environment [11].

On the other hand, it has been determined that impulsivity varies among different ethnicities. For example, Pedersen et al. (2012) found that impulsivity at least partly contributes to early alcohol use among European-Americans but not for African-Americans adolescents [12], and Kurtulus et al. (2015) reported that Indian consumers are the least impulsive buyers compared to Turkish and Chinese consumers [13]. Therefore, people in a country and even a city may have unique behavioral characteristics.

In this study, we aimed to evaluate the relationship between three factors, i.e. impulsivity, monthly income and educational level on water consumption in Urmia urban class families. Obviously, the results of this study, in addition to clarifying the role of the three factors in the pattern of water consumption, can emphasize the importance of behavioral characteristics in teaching patterns of consumption reform and designing the living space with consideration of the mentioned features.

## Materials and Methods

### Participants

The target group of this study was Urmia urban class families. 21 urban households were selected based on cluster sampling, including two families with five members, seven families with four members, six families with three members, and six families with two members. Demographic characteristics, including the age, average income and the house area of each family, and the level of education of each person were collected.

### Analysis of water consumption behavior in the study population

In order to study the behavior of water consumption in the study population, the pattern of household consumption was divided into two sections: general behavior and partial behaviors. In order to measure the general behavior, the bills for the last six months of households were reviewed and statistically compared with the standards determined by the Ministry of Energy. The

Ministry of Energy has identified daily consumption of 130 liters of water per person as standard.

### Impulsivity assessment

Barratt impulsivity scale 11 (BIS-11) was used to assess the impulsiveness of the participants. The BIS-11 includes 30 items that are scored to yield attentional, motor and non-planning impulsivity. The scale was published in the 1995 references article by Patton, Stanford, and Barratt. The internal consistency coefficients for the BIS-11 total score were reported in a range from 0.79 to 0.83 [14]. The Cronbach's alpha coefficient of the BIS-11 has been reported between 0.41 to 0.83 in the Iranian population [15]. The mean score of each family was used in subsequent analyzes.

### Data analysis

In order to describe the data, the central (mean) and dispersion (standard deviation) indices were used. In order to investigate the relationship between water consumption and educational level, income and impulsivity, Pearson correlation coefficient and the significance level of 0.05 were used.

## Results

The age of the participants was between 14 and 60, with a mean age of  $36.85 \pm 13.60$  years (Figure 1). The average monthly income of the families was  $1,739,705.88 \pm 429,904.43$  Tomans (Figure 2A). Overall, 8 households were living in apartments and 12 households were living in villa houses. All participants were literate, of which 3 had a PhD, 8 had master's degrees, 26 had bachelor's degree, 3 had an advanced diploma, 19 had a diploma, and 9 had a middle school education degree (Figure 2B).

The results showed that the average water consumption of four households were less than 130 liters of water per person and the average water consumption of the other households were more than 130 liters of water per person (Figure 2C). The total average water consumption was  $157.10 \pm 32.24$  liters of water per person.

The results of the assessment of participants with the BIS-11 showed that the scores are in the range of 38-63, and the total mean score was  $50.62 \pm 6.72$  (Figure 2D).

Correlation analysis between the three variables, namely water consumption, impulsivity and family income, showed a significant positive correlation between water consumption and impulsivity ( $r=0.498$ ,  $p\text{-value}=0.001$ ) (Table 1) so that with increasing BIS-11 scores, water consumption increases (Figure 3).

## Discussion

In this study, we found that the total average water consumption of the participated households was  $157.10 \pm 32.24$  liters of water per person, which was considerably higher than the standard amount, i.e. 130 liters/person/day. Excessive consumption of water now has become a national crisis, so that existing data show a significant rate of decrease in total water storage of approximately  $143.6 \text{ km}^3$  during the course of 2003 to 2009 [16].

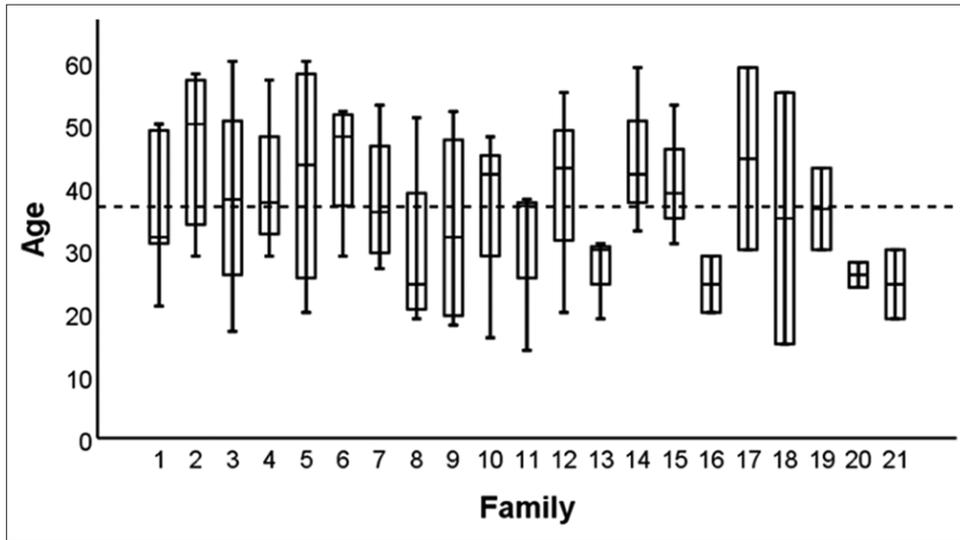


Figure 1. Distribution of age-related data in participated families. The dashed line shows the total age mean.

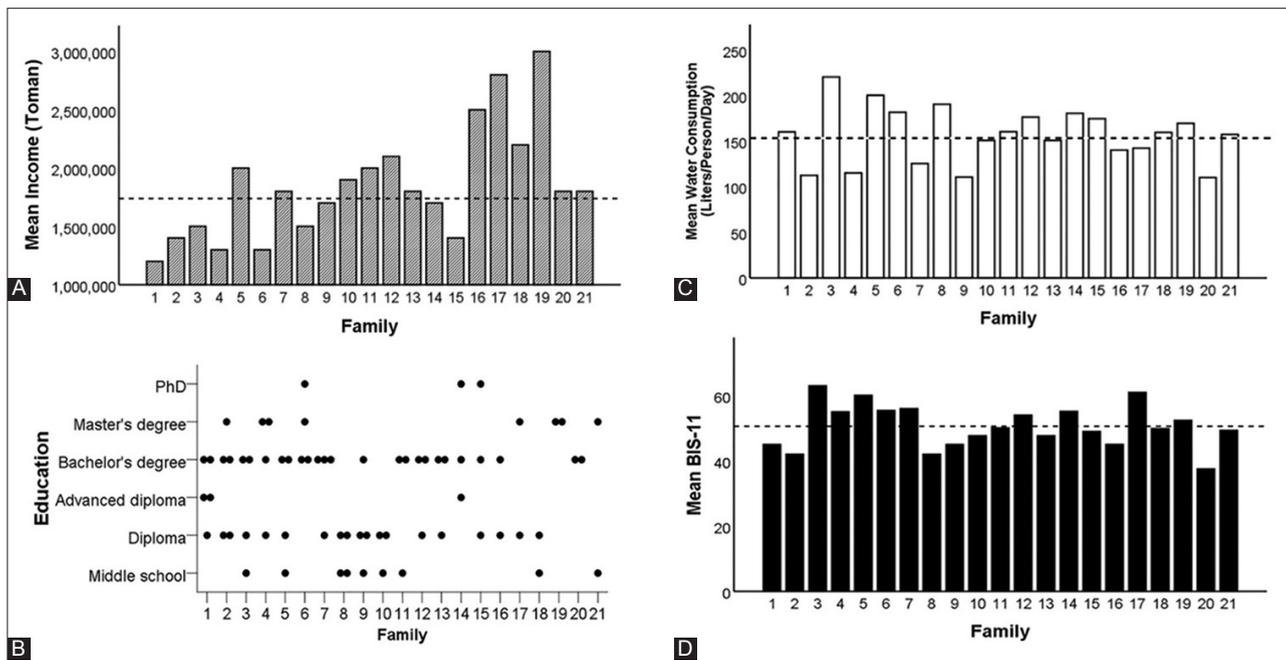


Figure 2. The (A) mean income, (B) education level, (C) mean water consumption and (D) mean BIS-11 score of the participated families. The dashed lines show the total averages.

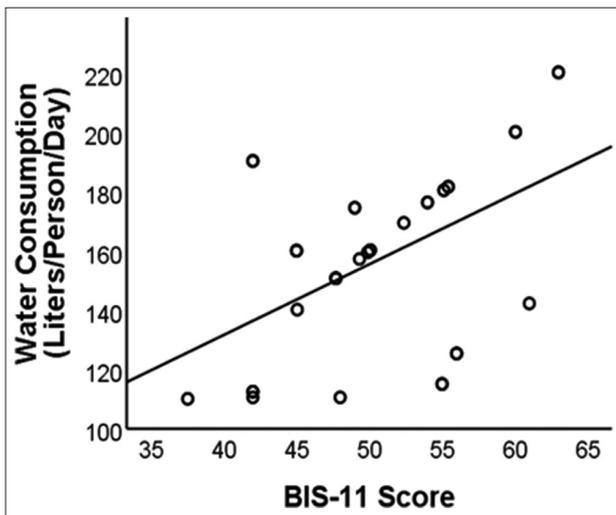
This problem takes into account the need to modify the pattern of consumption.

In this study, although most of the participants had the academic education, no significant relationship was found between the average level of education of families and their average monthly water consumption. This finding emphasizes the ineffectiveness of university courses in teaching the basics of life in today's societies. Therefore, it might be better if people, and especially students as the influential community of society, are more aware of the country's climate and the correct way to use existing resources.

Moreover, teaching efficient water consumption through social media can also play an important role in reforming the

pattern of consumption and sustainable development, as Amir Hossain et al. (2014) argued that the lack of adequate knowledge is one of the most important factors involved in excessive consumption of water [17]. Fan et al. (2014) have also suggested that changing the public understanding of the dangers of inappropriate water consumption patterns has prominent effects on water conservation behavior [18].

The assessment of families in terms of impulsivity showed that the level of impulsivity in them was moderate and low. Correlation analysis demonstrated a significant positive correlation between water consumption and impulsivity so that with increasing BIS-11 scores, water consumption increases. Therefore, in educating the proper pattern of water consumption,



**Figure 3.** The correlation between water consumption and the BIS-11 score of the participated families.

**Table 1. Correlation analysis between the four variables, education, water consumption, impulsivity and family income**

	Income	Water consumption	BIS-11	Education
<b>Income</b>				
Pearson correlation	1	0.021	0.207	-0.023
Sig. (2-tailed)		0.863	0.091	0.851
<b>Water consumption</b>				
Pearson correlation	0.021	1	0.498**	-0.062
Sig. (2-tailed)	0.863		0.000	0.613
<b>BIS-11</b>				
Pearson correlation	0.207	0.498**	1	0.167
Sig. (2-tailed)	0.091	0.000		0.174
<b>Education</b>				
Pearson correlation	-0.023	-0.062	0.167	1
Sig. (2-tailed)	0.851	0.613	0.174	

\*\*Correlation is significant at the 0.01 level (2-tailed).

it may be necessary to consider the behavioral characteristics of the target community, a topic that has not been addressed appropriately.

In this line, Lun et al. (2008) demonstrated that some personal characteristics, such as learning readiness and technical skills significantly affect learners [19]. Tyng et al. (2017) described the influences of emotion on learning [20] and Colomer et al. (2017) demonstrated the impact of inattention and hyperactivity/impulsivity traits on learning behaviors [21]. On the other hand, studies have shown that impulsivity has a negative relation with acceptance, so that with increased impulsivity, acceptance and behavioral flexibility decrease [22].

Furthermore, designing appropriate products today is one way to help optimal water consumption. On the other hand, it has been shown that designing products for each society should take into account the personality characteristics of the people in that society. For example, people with a business-like personality prefer product has greater performance quality [23]

and impulsive people usually look for products that can be used more easily and quickly [24].

**Conclusion**

In conclusion, in this study, we found a significant positive correlation between water consumption and impulsivity, so that with increasing impulsivity, water consumption increases. However, there was no significant relationship between the level of education and the average monthly income with the amount of water consumption by the families. The results of this study show the importance of education in changing the pattern of water consumption as well as considering the behavioral characteristics in the education process.

**Conflict of interest**

The authors declare that there is no conflict of interest with regard to the present study.

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