

The Role of Drinking Water Shortages on Human Psychological Functioning

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ABSTRACT

This study is grounded on an ecopsychological approach towards the effect of water shortages on human psychological functioning. The purpose of this study was to: (1) to examine the prevalence of psychological problems in rural residents with and without water shortages; (2) to evaluate human attributions about the possible causes of water scarcity; (3) to explore human coping styles towards water shortage; and (4) to recognize the role of sociocultural factors on the aforesaid factors. Participants included 3850 Iranian rural residents, those with water shortages (WWS), and those without water shortages (WOWS). A demographic questionnaire and several self-rating measures were used. Resulting data indicates that the prevalence of mental health problems is significantly higher in rural residents who suffer with water shortages. Attributional styles towards water shortages consisted of four components: personal, social, natural, and organizational. Coping styles of participants (with water shortages) indicated an emotional-avoidant coping style, the utilization of water consumption methods to optimize water usage, the use of water-free technologies, social adaptation to life with regards to water, and the application of high quality technologies for water saving. Demographic and sociocultural factors influence psychological functioning with regards to water scarcity. This study demonstrates that mental health problems are more prevalent in areas with water shortages. It also indicates the impact of attributional styles, coping methods and the role of demographic and sociocultural factors on psychological functioning when water shortages occur.

Key words: drinking water shortage; Human psychological functioning; Attributional style; Mental health; Coping style.

INTRODUCTION

The impact of climate change on water resources is the subject of much research and debate, with other factors such as over population also influencing the availability of water resources. Drinking water is essential for life. Of concern, is how access to drinkable water will impact on humans. The majority of people on Earth will experience severe pressure with regards to fresh water availability as a consequence of climate change¹. Factors such as climate change, industrialization, and over population may already be impacting on fresh drinking water

resources. This is likely to cause an increase in the frequency and severity of droughts and water scarcity. More than 3.4 million people die each year from utilizing polluted water sources and from unsafe drinking water factors; particularly in the developed world². In addition, nations in the Middle East and North Africa could face potentially catastrophic water disasters in the near future¹. According to Iranian officials this potential for disaster may occur in Iran too². Therefore, the purpose of this study is to investigate human psychological responses to water shortages in an Iranian sample.

In the field of drought and psychology, there is substantial international literature about the role of drought on mental health and psychopathology in rural residents who live in drought-affected regions³⁻⁶. However, there is limited research about the effect of drinking water shortages on human psychological functioning. The present study is grounded on natural disasters, stress, worry, attributional styles and emotion theories¹⁰⁻¹⁶.

In line with the aforementioned theories, the present study suggests that people perceive water shortages as a natural disaster which threatens their very existence, and not merely as a source of general stress.

Psychological functioning in relation to water scarcity is therefore investigated with this in mind. Psychological functioning includes four constructs: mental health problems, perceived-stress, worry and negative emotions. The role of water shortages on mental health among humans is a relatively well-known issue; however its effect on perceived stress, worry and negative emotions is not as well known and forms the exploratory aspect of this study. It is hypothesized in this study, that human psychological responses towards drinking water shortages are different to human reactions to loss and catastrophic traumas. Therefore, the present study speculates that psychological responses to water shortages could be explained according to the attribution of its causality, human reactions to this disaster, and the role of cultural elements toward this phenomenon, and possible solutions for its management and control. According to the aforesaid theories and literature; the present study has four aims: (1) to examine the prevalence of psychological problems in rural residents with and without water shortages; (2) to evaluate human attributions about the possible causes of water scarcity; (3) to explore human coping styles toward water shortages; and (4) to recognize the role of sociocultural factors on the aforesaid constructs. The first hypothesis is that the prevalence of psychological problems in rural residents with water shortages (WWS) is greater than rural residents without water shortages (WOWS). The second hypothesis of this study is that attributional style towards the cause and effect of water shortages is a multifaceted construct. The third hypothesis of this study is that coping style

towards water shortages is a multifaceted construct in this sample. The fourth hypothesis of this study is that sociocultural factors (i.e. age, gender, the level of education, occupation, ethnicity, marital status, monthly income, the family size, city and village of residence) would have a significant influence on attributional and coping styles towards water shortages in this sample.

Method

Participants

The participants were 4180 rural residents from two regions: Darab and Zarindasht; and Eghlid cities, Fars province, Iran. A total of 330 individuals' data was removed due to their invalid responses to the measures. Participants in the group with drinking water shortages (WWS) were 3690 rural residents from 57 villages around Darab and Zarindasht cities, from the southern of Fars province. Participants in the Group without drinking water shortages (WOWS) were 160 rural residents from Dejkord district around Eghlid and Sarhad-e-Chahar Dange, the northern of Fars province. This sample included 1927 males and 1923 females. The total sample of rural residents consisted of 3850 participants. The mean (and standard deviation) of the age of the total sample was 41.90 ($SD = 8.13$). Participants were selected from all the villages in and separated into two groups using the random sampling method. As an incentive, they received psychological consultations to assist in adaptation to water scarcity, as well as technological information about drinking water equipment. This sample was recruited from all those villages with more than 10 families around the aforesaid cities. After informed consent was acquired, participants completed a questionnaire containing several sections on background information, and six self-rating inventories.

Instruments

The demographic questionnaire included items on age, gender, marital status, ethnicity, educational level, job status, number of family members, monthly income, monthly drinking water usage, monthly water price, and the city and village of residence.

Nine inventories were used: (1) Attributional Scale of Water Shortage Causes (ASWSC), (2) the Positive and Negative Affect Schedule (PANAS¹⁷),

(3) the General Health Questionnaire 28 (GHQ-28¹⁸), (4) the Ahwaz Worry Inventory (AWI¹⁷), (5) the Perceived Stress Scale (PSS¹⁹), and (6) the Coping Styles with Drink Water Crisis (CSDWS⁸). The PANAS contains 20 items which include a positive affect (PANAS-P; 10 items) and a negative affect (PANAS-N; 10 items). Each item is rated on a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (very much or extremely). There has been considerable support for the construct validity of the PANAS. The GHQ-28 is a 28 item and a self-administered screening scale that measures four factors: somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. AWI consists of 20 items with four possible answers that include "always", "often", "sometimes" and "never" with numerical values of 3, 2, 1, and 0 respectively, and its scores range from 0 to 60. PSS is a 10-item scale and each item is rated on a 5-point scale ranging from never (0) to almost always (4). The CSDWS was developed to identify types of coping styles towards drinking water shortages in rural residents in the time of drought. All tests were administered in the Persian language. After reading the Informed Consent Form, all participants had the opportunity to ask any questions about the study before signing the informed consent.

RESULTS

To examine the first hypothesis several calculations for the prevalence rate of psychological problems were conducted with water shortages

as the independent variable and mental health problems, stress, worry and negative emotions as dependent variables in this sample (table 1).

The initial data analysis related to the second hypothesis included an exploratory factor analysis that was conducted to examine the potential factors in the ASWSC. Principal factor analysis with varimax rotation was used to determine the construct validity of the ASWSC, and this analysis considered eigenvalues higher than 1. Factor analysis specification was satisfactory, $KMO = .86$, *Bartlett's Test of Sphericity* = .982, $df = 508$, $p = .0001$, *Rotation Sums of Squared Loadings* = 72.46. Factor analysis indicated that ASWSC consisted of four factors and eigenvalues for nine factors ranging from 1 to 5.49. These four factors explained a total of 72.46% of the variance. These factors included: (1) personal, (2) social, (3) natural, and (4) organizational attribution styles.

To examine the third hypothesis, a confirmatory factor analysis was conducted to examine the potential factors in the CSDWS. Principal factor analysis with varimax rotation was computed to determine the construct validity of the CSDWS, and this analysis considered eigenvalues higher than 1. Factor analysis specification was satisfactory, $KMO = .85$, *Bartlett's Test of Sphericity* = .984, $df = 516$, $p = .0001$, *Rotation Sums of Squared Loadings* = 75.66. Table 1 shows the significantly rotated correlation of higher than .30 for 52 items in 15 iterations. Factor analysis indicated that CSDWS

Table 1 : The Prevalence Rate of Psychological Problems in Rural Residents with and without Water Shortage

Psychological Problems		Rural Residents with Water Shortage	Rural Residents without Water Shortage
Mental Health Problems	Somatic Complaints	29.2	1.2
	Anxiety/Insomnia	27.6	1.1
	Social Dysfunction	51.7	1.3
	Depression	11.6	0.2
	Total Mental Health Problems	20.7	0.8
Perceived Stress		10.7	0.4
Worry		24.1	1.3
Negative Emotions		17.78	0.6

Table 2: The Effects of Demographic and Socio-cultural Factors on Attribution Style, Psychological Problems, Negative Emotions, Stress and Worry in the Total Sample

Independents	Wilks'k	F	df	p
City	.549	95.24	28,7	.0001
Region	.976	6.48	14,3	.0001
Village	.123	9.59	868,5	.0001
Age	.206	11.91	518,4	.0001
Gender	.893	31.36	14,3	.0001
Marital Status	.971	3.95	28,7	.0001
Education	.709	13.25	98,2	.0001
Occupation	.753	15.35	70,1	.0001
Monthly Income	.742	16.78	70,1	.0001
Family Size	.739	13.61	84,2	.0001
Ethnicity	.868	12.71	42,1	.0001

consisted of four factors and eigenvalues for nine factors ranged from 1 to 5.49. These four factors explained 75.66% of the variance. These factors included: (1) optimizing water consumption methods, (2) water-free technologies and social changes in life, (3) application of high quality technologies for water saving, and (4) emotional-avoidant styles.

To evaluate the fourth hypothesis with regards to the influence of the independent variables from the sociocultural and demographic category, a multivariate analysis of variance (MANOVA) was computed. The Independent variables considered were age, gender, the level of education, occupation, ethnicity, marital status, monthly income, the family size, city and village of residence; whilst the dependent variables considered were attribution styles, psychological problems (i.e. mental health problems, stress, worry and negative emotions) and coping styles (with water shortages). An overall multivariate analysis demonstrated the significant effects of age, gender, educational level, occupation, ethnicity, marital status, monthly income, the family size, city and village of residence (independent variables) on the specified dependent variables (table 2).

DISCUSSION

Results from the first hypothesis in this study showed that the prevalence of mental health

problems, stress and worry is significantly higher in WWS rural residents compared to WOWS residents. These findings are consistent with previous research that indicates the role of drought and water shortages on the mental health of rural residents²⁻⁸. In addition, these findings are congruent with predictions of ecopsychology relating to natural disasters, stress, worry and emotions^{10, 11, 14, 21, 22}. These findings demonstrate the human-nature interaction in the field of mental health and psychopathology. Therefore natural hazards such as water shortages may reduce human adaptation and, in turn, increase the probability of developing mental disorders.

Results from the second hypothesis indicated that the attributional style toward water shortages is a multidimensional construct with four subscales. These factors included: (1) personal, (2) social, (3) natural, and (4) organizational attributional styles. These findings show that the meaning of water shortages, (based on an individual's approach) motivates people to find a cause and then apply an explanation based on his/her knowledge of the environment. For causal explanations and effect inferences about water shortages, people look for attributions related to the behaviors of others, organizations, and themselves. These findings are congruent with predictions of attributional theory about cause and effect inferences of different physical and social events²¹. This study shows the application of attributional theory when understanding and managing natural disasters such as water shortages. Also, this study suggests that the nature of cause and effect inferences about water shortages may be influenced by sociocultural factors such as gender, ethnicity, and so forth that need further investigation. In practice, the present finding may be of value in creating an efficient program about water shortages at a community level. This result may prove useful for developing strategies that will ensure that people conserve water resources in rural regions. Therefore people with information may then have personal, social and organizational attributions about the causality of water shortages which provide options on how to change their lifestyles with regards to water consumption and how to prompt water conservation at social level; and will assist them to make social and organizational institutions more responsible about water management and conservation.

Results from the third hypothesis in this study using confirmatory factor analysis confirmed the previous structure of coping style with regards to water shortages. This factor structure includes four levels of factors: (1) optimizing water consumption methods, (2) water-free technologies and social changes in life, (3) application of high quality technologies for water saving, and (4) emotional-avoidant styles. This result is in line with previous literature⁶. Also, this finding may be explained in line with stress and coping theory¹². This study suggests that social and personal changes in life style are essential for efficient coping with water shortages in drought-affected regions. This study explores the necessity of changes in primary and secondary appraisal when people encounter a chronic and slow form of natural disaster such as water shortages. According to these findings, people should be changing their personal and familial life styles towards a standardized procedure for water consumption. For example, they should only use drinking water inclusively for drinking purposes rather than for car washing, horticulture and agriculture purposes. Also, they may teach the standard usage of drinking water to children by the application of modeling and behavior modification principles. People can adapt some of their social rituals to reduce the irrational use of drinking water, particularly rituals about weddings and funerals in the rural regions. In addition, most of the water equipment in the rural areas is old and inefficient for water preservation purposes. Rural residents could use a few modern and standard water taps instead and they can teach these principles to their children and families. Finally, these findings show that people should be educated about the fact that water shortages are real and they can not cope with it by emotional and avoidant styles such as substance abuse, mystery and prayer.

Results from the fourth hypothesis demonstrated the role of demographics and socio-cultural factors on psychological problems and coping styles toward water shortages in the total sample. Results showed that WWS rural residents have significantly lower levels of psychological problems, stress and worry and a significantly greater performance in optimizing water consumption methods, water-free technologies and social changes in life, and application of high

quality technologies for water saving compared to WWS residents. Individuals of 40-years-old and over have significantly higher levels of psychological problems and a greater use of successive coping style with water shortages, than individuals of a lower aged-range. Married people have higher psychological problems, stress and worry than single individuals. Females have greater psychological problems and a lower performance in rational coping with water shortages than males. Individuals with lower educational levels have higher psychological problems and lower performance in the application of a rational coping style with water shortages, compared to individuals with higher educational levels. Farmers, housewives and unemployed individuals have greater psychological problems than governmental employee and sellers. However, farmers, housewives and employed individuals tend to use rational coping styles in relation to water shortages than the unemployed and sellers. Lower income is linked with higher psychological problems and with the application of avoidant-emotive coping with water shortages. Also, greater family size is linked to higher psychological problems and the higher use of rational coping toward water scarcity. People with Turkish ethnicity have higher psychological problems, and they use lower rational coping towards water shortages in comparison to Lur and Fars individuals. These findings are consistent with the studies that affirm the roles of sociocultural and demographic factors on psychological functions of individuals, under the conditions of natural hazards and disasters²³⁻²⁷. The influences of demographics and socio-cultural factors on mental health and coping towards water shortages in this study show the beneficial application of a cultural-oriented approach in the ecopsychology of natural disasters management.

In conclusion, the present study advocates an ecopsychological approach to the understanding and management of water shortage, because it explains the role of water shortages in the prevalence of psychological problems; multidimensional structure of attribution and coping styles towards water shortage; and the influences of demographics and socio-cultural factors on the aforesaid constructs in a sample of rural residents in Iran. These findings can be applied by clinicians and policy makers for assessment and intervention purposes of

natural hazards in psychotherapeutic and social settings. This study recommends the training of ecopsychology elements to strengthen psychological function towardst water shortages among people in drought-affected regions. Moreover, these findings highlight the necessity of life style changes toward drinking water everywhere. However, the present

study is limited because it relies on a survey design and the use of a few self-rating scales. Future investigations should examine the role of water shortage on physical health, social behaviors, creativity and innovation and life style in cross-cultural samples within longitudinal designs.

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