Trakia Journal of Sciences, Vol. 12, Suppl. 1, pp 381-384, 2014

Available online at:
http://www.uni-sz.bg

ISSN 1313-7050 (print)
ISSN 1313-3551 (online)

PSYCHOLOGICAL FACTORS OF CORRELATION BETWEEN PAIN TOLERANCE, PAIN THRESHOLD AND OBESITY

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ABSTRACT

The obesity is a significant social and medical problem for children and adults. Many recent studies suggests that genetic, physiological, environmental and behavioral factors contribute to it. In addition many articles support the idea that there is a strong relationship between obesity and pain. PURPOSE: The purpose of this study is to explore relationship between pain tolerance, pain threshold and obesity. METHODS: The present study was carried out on 60 volunteers of which 19 subjects with BMI>30kg/m2 and 41 subjects with BMI<30kg/m2 (non-obese). RESULTS: Pain detection and pain tolerance thresholds to cold were determined. The influence of gender age, BMI, bodily symptoms of stress, anger and optimism were analyzed. CONCLUSIONS: The study results suggests the presence of correlation between pain tolerance and obesity which is affected by behavioral and personality factors.

Key words: optimism, cold pressure test, acute pain, stress

Overweight and obesity are chronic conditions with great social and economic importance. They both are a consequence of an energy imbalance over a period of time. The cause of this energy imbalance can be a result from combination of several different factors and varies from one person to another. Environmental factors, individual behaviors, and genetics contribute to the complexity of the obesity nowadays. An *energy imbalance* arises when the number of calories consumed is *not equal* to the number of calories used by the body. *Weight gain* when the people consuming too many calories and not expending enough through physical activity. Excess energy is stored in fat cells, which enlarge or multiply. Enlargement of fat cells is known as *hypertrophy*, whereas multiplication of fat cells is known as *hyperplasia*. During kind of period of time the excesses in energy storage lead to obesity. Body mass index (BMI) is a

(kg)/ height squared (m^2). It is used to describe an individual's relative weight for height, and is mathematical ratio which is calculated as weight significantly correlated with total body fat content. Obesity is associated with significantly impaired quality of life. Higher BMI values are associated with greater health risk for the any individual. There are several differences between man and women in the medical and especially social consequences of obesity. For example, obese women appear to be at a greater risk for psychological dysfunctions. This may be due to the social impact on women to be thin. On the other hand the weight loss has been consistently associated with improved quality of life among both women and man. Obese patients who lost more than 30 kg through gastric bypass demonstrated improved quality of life scores to such an extent that their post-weight loss scores were equal to or even better than population norms (1).

A number of studies have positively correlated the experience of pain with an increase in body mass index (BMI) (2, 3). The causal relationship between the two remains unclear: It is not known whether obesity causes chronic pain, chronic pain causes obesity or some other factor causes both concurrently. Obesity is hypothesized to lead to pain because of excess mechanical stresses and its pro inflammatory state. Chronic

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pain may result in obesity because of physical inactivity and utilization of eating for analgesic effect. Genetic, psychological or metabolic factors may also lead to both obesity and pain (chrocic and acute) .(4)

Aim: The main task of this study is to identify some psychological factors that might contribute to the individual's pain experience - personality factors (optimism) and behavioral factors (connected with obesity and anger).

Participants: 60 volunteers – students and personnel at the Trakia University were examined. Age - 19 and 61 years. Male – 21, female - 39. BMI>25kg/m2 - 19 subjects (overweight and obese). BMI<25kg/m2 - 41 subjects (non-obese). Women in follicular menstrual phase - 24 ; Women in luteal menstrual phase - 15. Gender, age, height, weight and body-mass index (BMI) were recorded. Then the volunteers were asked to fill out three questionnaires: Optimism and negative expectations Inventory (5); State- Trate Anger Expression Inventory (6); Subjective health assessment scale (7) - part 1 – stress, Part 2 – stress symptoms.

Pain measurements - Cold pressure test: The dominant hand was immersed up to the wrist in ice-chilled water (1.5 ± 0.5°C). The participants were instructed to hold their left hand in the ice water as long as possible. Each subject was instructed to say "painful" when the cold stimulus first became painful. Pain threshold - The time (sec) until the participant first reported pain. Pain tolerance - The time (sec) until the participant withdrew his/her hand from the water due to that pain became too intensive. Systolic and diastolic blood pressure -measured on the non-dominant arm before, during and after each intervention. Heart rate was determined. (8).

RESULTS

Gender and pain

The IASP's definition of pain (9) – Pain is not a directly observable or measurable phenomenon. Pain is a subjective experience that bears a variable relationship with tissue damage. In experimentally induced pain studies, the majority of results show that women are comparatively less tolerant and more sensitive to noxious stimulation than men (10, 11, 12, 13). However, not all studies report this result. The results of this study suggests that there aren't significant differences between male and female (t=0.36;p<0.4) in pain threshold. On the other hand male subjects presents significantly higher pain tolerance than women (t=2.90;p<0.05). **(Figure 1).** This result may associate with cultural standarts as well as with some biological factors as hormones. The other mediator of this connection between gender and pain tolerance is stress. Women in this study shows higher levels of stress, which increase their sensibility and decrease especially their pain tolerance (t=2.67;p<0.05) **(Figure 2).**

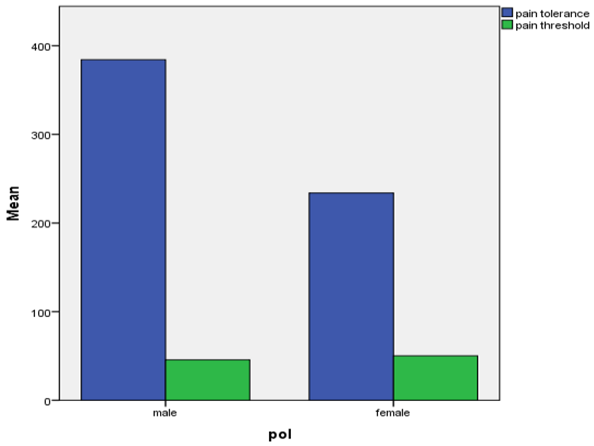

Figure 1. Comparison between male and female subjects on levels of pain threshold and pain tolerance.

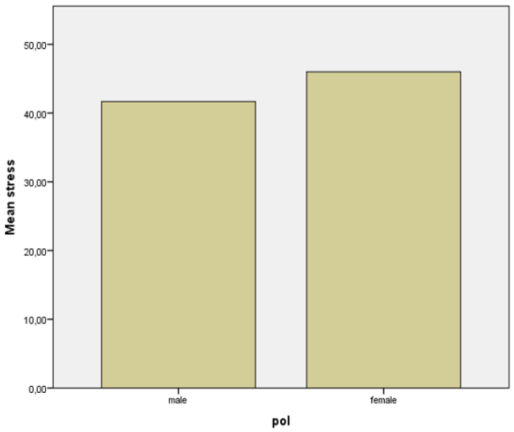

Figure 2. Comparison between male and female subjects on levels of stress.

Biological factors. The effects of menstrual phase within women subjects on pain threshold and pain tolerance were also examined. Significant differences between women in follicular and luteal phase were found among pain tolerance. The subjects which were in follicular phase presents higher pain tolerance. (F=8,12;p<0,001) This result suggest that the

gender – pain relationship may be mediated, in part, by biological factors.

Personality factors, associated with pain. General expectation for obtained results were examined. In this study optimists presents lower pain threshold ($t=1.97$; $p<0.05$) and lower pain tolerance ($t-2.11$;$p<0.05$) than subjects with negative expectations. This result put us in front of additional questions about the role of expectations and other mediators of connection between personality and pain experience **Figure 3.**

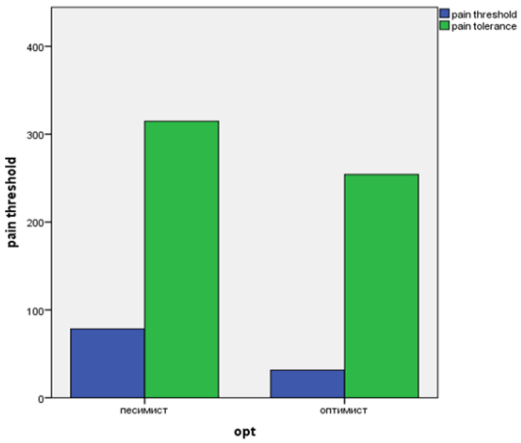

Figure 3. Comparison between optimists and subjects with negative expectations on levels of stress.

Pain, obesity

Physiological symptoms of stress are presents more often when the BMI increase. In this study obese subjects feels symptoms like headache, insomnia, fatigue, lost of appetite more often than subjects with normal wight. **(Figure 4)**

Pain tolerance increase when the BMI increase too, but there is not significant differences between groups by BMI. **(Figure 5)**. The results of various studies of this connection between obesity and pain are inconsistent. Some studies suggests that obese individuals were shown to be significantly more pain sensitive (14, 15). However, other studies have shown the opposite—decreased pain sensitivity in the obese subjects (16, 17). This variety of the results refers to the idea that there are additional variables which have to be explored.

CONCLUSIONS

1. Pain threshold is higher in subjects with BMI>25. This result turn us to discuss decreased pain sensitivity in the obese people.
2. Overweight and obese subjects shows less pain sensitivity but more stress symptoms
3. The relationship between pain and stress among women is affected by biological factors like hormones.
4. The relationship between gender, pain and obesity is not simple, further evaluation of this issue as it's relation to pain tolerance would be of value.

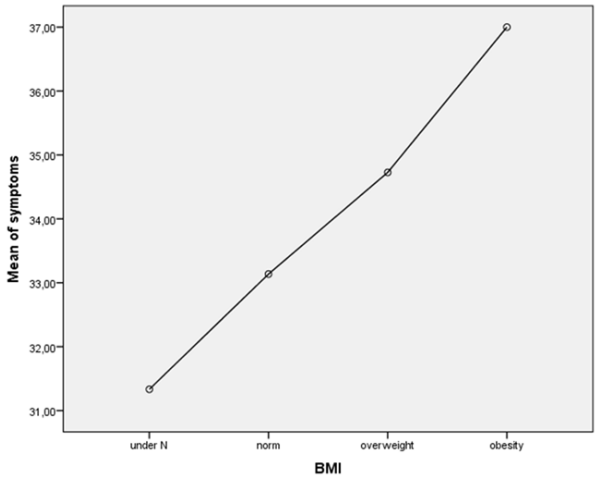

Figure 4. Mean of stress symptoms among subjects with different BMI.

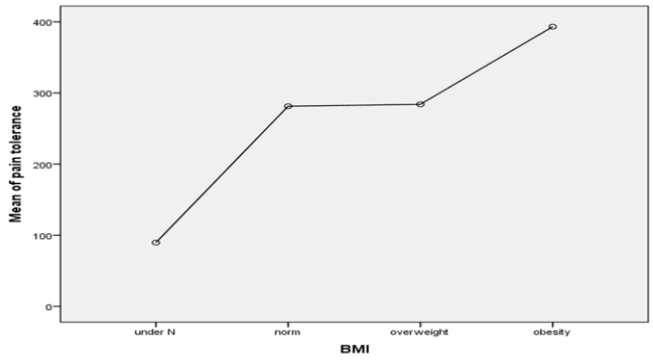

Figure 5. Mean of pain tolerance among subjects with different BMI.

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