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Original Research Article

The Correlation between Some Stress Hormones in Cyber Gaming Practitioners in Samarra

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Abstract: The current study aimed to find the relationship between excessive addiction to electronic games and its effect on anxiety and stress hormones and some biochemical variables in groups of young people and adolescents· The experiment was conducted from the beginning of October 2024 until the end of December 2024· Samples were collected from schools, some entertainment places and gaming halls designated for electronic games in the city of Samarra· 90 blood samples were collected and divided into two groups: (30) samples from young people and adolescents, which is the control group, who do not play electronic games, and 60 samples from young people and adolescents, which is the non-control group, who play electronic games· The results showed a significant difference (P≤0·05) in the concentration levels of glucagon and cortisol in the group of patients compared to the healthy group· There was no significant difference (P≤0·05) in the concentration levels of insulin, adrenaline and acetylcholinesterase in the group of patients compared to the healthy group.

Keywords: Cortisol, Insulin, Glucagon, Adrenaline, Acetylcholinesterase.

1- INTRODUCTION

In the age of modern technology, video games have become an integral part of many people's lives, especially among young people and adolescents. Despite their benefits in developing certain skills, such as quick wit and strategic thinking, excessive use can develop into an addiction that negatively impacts mental and physical health, leading to social isolation and a decline in academic or professional performance (Vukusic Rukavian *et al*., 2021). Video game addiction is a growing phenomenon that requires awareness and serious action by families and society to mitigate its negative effects and promote the balanced use of technology. Video game addiction is also an effective and influential variable in many social, psychological, behavioral, and cultural aspects. Video game addiction is characterized by the compulsive and uncontrollable practice of various types of video games. Video game addicts spend long hours playing these games, whether via mobile phones, computers, or various gaming devices, such as the PlayStation, Xbox, and other devices (Tortolero *et al*., 2014). Neuroscientists and researchers are deeply interested in video games due to their direct impact on the nervous system. Thanks to their properties, these games activate various regions of the brain, including cortical areas such as the frontal cortex and visual cortex, as well as subcortical areas such as the hippocampus and amygdala, which are closely linked to emotions and cognition, making them essential to personal behavior and cognitive functions (Underwood, 2016). Stress is considered a basic cognitive response that is greatly influenced by video games, while stress is defined as a mental state that affects both the mind and body and is associated with the frontal lobe, which is responsible for cognition and the experience of stress· Stress is divided into two types: acute and chronic. Acute stress stimulates the autonomic nervous system, causing abnormally high cortisol levels, accelerated heart rate, increased breathing rate, and increased blood pressure· This causes blood flow to be redirected from the peripheral organs to the large muscles, preparing for the "fight or flight" response· Chronic stress, on the other hand, refers to the long-term effects of persistent stressors on a person's life and may lead to neurological disorders such as anxiety and depression (Miller, 2009). Video game addiction can affect several hormonal and biochemical variables related to psychosocial disorders, most notably disruption of the HPA (Hyperactivity Disorder) system, which regulates anxiety and stress responses. This addiction also interferes with the

body's energy metabolism by affecting insulin and glucagon levels, which play a key role in regulating blood glucose levels· Acetylcholine is also an important neurotransmitter that affects psychological and behavioral states, and altered levels may be associated with impaired concentration and impaired cognitive performance (Halbrook *et al*., 2019).

2- MATERIALS AND METHODES

1.1 Study Design

Samples were collected from young males and male adolescents between the ages of 13-26 in schools, some entertainment and public places in Samarra, for the period from the beginning of October 2024 to the end of December 2024· The study included 90 individuals who were divided into two groups as follows: 30 samples of non-addicted youth and adolescents, which are the Estimation controlled group, and 60 samples of young adults and adolescents who are addicted to electronic games.

2.1 Standards and Tests Studied

Estimation of Cortisol Activity in Serum

Serum cortisol concentration was measured using a ready-made cortisol estimation kit from the Chinese company Shanghai. Serum cortisol concentration was determined by the Enzyme Immunoassay (ELISA) technique. Wells were coated with cortisol antibodies, then the sample or standard containing antigen was added, followed by the enzyme horseradish peroxidase (HRP) to bind to the antigen antibodies. The wells were then incubated. After incubation, the wells were washed to remove any unbound hormone· Chromogen was then added, turning the blue color to yellow. The absorbance was measured at a wavelength of 450 nm, after which the activity of cortisol was estimated.

Estimation of Insulin Activity in Serum

Serum insulin concentration was measured using a Shanghai insulin assay kit. Serum insulin concentration was determined using the ELISA technique. The wells were coated with insulin antibodies, then the sample or standard containing antigen was added· Horseradish peroxidase (HRP) enzyme was added to bind to the antigen antibodies. The wells were then incubated. After incubation, the wells were washed to remove any unbound hormone. Chromogen was then added, turning the blue color yellow. The absorbance was measured at a wavelength of 450 nm, after which insulin activity was estimated.

Estimating the Effectiveness of Glucagon in Serum

The concentration of glucagon in serum was measured using a glucagon-based kit from Shanghai, China. The concentration of glucagon in serum was determined using the Enzyme Immunosorbent Assay (ELISA) technique. The wells were coated with glucagon antibodies, then the sample or standard containing antigen was added. Horseradish peroxidase (HRP) was then added to bind to the antigen antibodies. The samples were then incubated. After incubation, the wells were washed to remove unbound hormone. The colored chromogen was then added, turning the blue color yellow. The absorbance was then measured at a wavelength of 450 nm. The effectiveness of glucagon was then estimated.

Estimation of Adrenaline Activity in Serum

The concentration of adrenaline in serum was measured using a adrenaline-based kit from Shanghai, China. The concentration of adrenaline in serum was determined using the Enzyme Immunosorbent Assay (ELISA) technique. The wells were coated with adrenaline antibodies, then the sample or standard containing antigen was added· Horseradish peroxidase (HRP) was then added to bind to the antigen antibodies. The samples were then incubated. After incubation, the wells were washed to remove unbound hormone. The colored chromogen was then added, turning the blue color yellow. The absorbance was then measured at a wavelength of 450 nm. The effectiveness of adrenaline was then estimated.

Estimate the Efficacy of Acetylcholine Styrease in the Blood Serum

Serum acetylcholinesterase concentration was measured using the modified Ellman method (Ellman *et al*., 1961). The Ehman procedure is commonly used to determine acetylcholinesterase and monitor its hydrolysis by acetylcholinesterase (AchE) or butyrylcholinesterase in the laboratory. The Ehman method is based on the reaction of thiocholine (one of the products of the enzymatic hydrolysis of ACH by acetylcholinesterase) with 5·5% dithiobis-2-nitrobenzoic acid (DTNB, also known as Ehman's reagent), forming a yellow product (5-mercapto-2-nitrobenzoic acid and dissociated forms) at pH 8· The maximum absorption coefficient is found at 412nm·Thesereactions are based on:

Acetylthiocholine---->thiocholine+acetate
Thiocholine + dithiobisnitrobenzoate ---->5-mercapto-2-nitrobenzoic acid·

3 – Statistical Analysis:

The results obtained from the current study were analyzed using the SPSS statistical programme, and the T-Test test was applied at 0·05 indication level to determine the extent of the meaning of the differences between aggregates.

4- RESULTS AND DISCUSSION

4.1 Results

The results shown in Table (1) indicate a significant difference in cortisol in the group of addicts (122·844±25·861) compared to the group the healthy ones (135·634±26·217). The results of the insulin concentration indicate that there is no significant difference (P≤0·05) in the group of addicts (11·339±2·868) compared to the group of healthy people (12·313±3·233). The Glucacon concentration may indicate a significant difference (P≤0·05) in the group of addicts (625·361±76·946) compared to the healthy group (565·256 ±79·622).

Table 1: The concentration of cortisol, insulin and clocacon in the studied groups

Group	cortisol	insulin	Glucacon
Addicts	(122·844±25·861)	(11·339±2·868)	(625·361±76·946)
Healthy people	(135·634±26·217)	(12·313±3·233)	(565·256 ±79·622)

The results shown in Table (2) may indicate that there is no significant difference (P≤0·05) in the concentration of adrenaline in the group of addicts (24·957 ± 5·342) compared to the group of healthy people (24. 890 ± 3. 942). The results of the effect of acetylcholine choline styrease indicate that there is no significant difference (P≤0·05) in the group of addicts (418·275 ± 104·173) compared to a group Al-Ashaha (419·607 ± 131·229).

Table 2: The concentration of adrenaline and acetylcholine choline in the studied groups

Group	adrenaline	acetylcholine choline styrease
Addicts	(24·957 ± 5·342)	(418·275 ± 104·173)
Healthy people	(24·890 ± 3·942)	(419·607 ± 131·229)

4.2 Discussion

The current research showed that there are statistical differences at the level of cortisol concentration between the group of infected people (addicts) on electronic games and the healthy control group· Cortisol levels have decreased significantly compared to the group of healthy people, which showed that the addiction to electronic games and the increase in cortisol levels, which is the main biomarker of the body's response to stress and stress. Emotional, as the hormone insulin was shown, through the results of the current study, that there are no statistical differences at the level of the average hormone insulin concentration among the group of patients (addicted) on electronic games and the control group (healthy). The insulin levels have decreased significantly compared to the healthy group, and this decrease indicates a defect in metabolic regulation or the onset of insulin resistance in individuals addicted to electronic games, but the decrease in insulin is linked to several factors· Behavioral and psychological common among addicts of electronic games, including prolonged sitting, lack of physical activity and low sensitivity of cells to insulin, which forces the pancreas to secrete more to maintain blood sugar balance (Marin *et al*., 2011). The addiction to electronic games is associated with unhealthy eating habits, such as eating a lot of foods rich in sugars and fats, which leads to a sudden rise in glucose levels and thus a secondary rise in the hormone insulin as a natural response to this dietary pattern. (Lebby *et al*., 2023). Chronic psychological stress may be associated with excessive exercise, especially those that require high concentration, or include competitive or hostile content, with an increase in cortisol secretion, and it has been proven that high cortisol is closely related to resistance· Insulin as cortisol boosts glycogen decomposition and increases the production of hepatic glucose, which requires the secretion of higher amounts of insulin (Black, 2006).

The hormone cortisol (the stress hormone) is associated with the hormone insulin (the regulator of blood sugar) in an adverse relationship. When cortisol rises as a result of stress or chronic stress (such as electronic gaming addiction, it leads to a decrease in the body's sensitivity to insulin, an increase in glucose production in the liver, causing insulin resistance over time, which leads to a decrease in the effectiveness of insulin, and an increased risk of metabolic disorders. Conversely, low levels of cortisol – as may occur as a result of persistent stress – may also be accompanied by a decrease in insulin secretion as a result of a hormonal regulatory disorder· It reflects a functional disorder of the neuro-greek and pancreatic axis (Joseph and Golden, 2021). Electronic games and the group of control (healthy); where the levels of the addicts increased significantly compared to the group of healthy people, and this rise indicates that it shows the excessive use of electronic games and the chronic increase in glucacon levels may be an indication of Insulin resistance, especially in adolescents whose bodies change rapidly and are more susceptible to hormonal imbalances (Heinrichs *et al*., 2021)· Glucagon is one of the essential hormones in which the body regulates blood sugar levels, and is secreted from the cells of the Cells Alpha, which are found in pancreatic islands of Lankerhans· Glucacon acts against the hormone insulin, as it raises the concentration of glucose in the blood by stimulating the processes of glycogen decomposition and the formation of glucose from non-carbohydrate sources in the liver (Melhorn *et al*., 2020)·

With regard to adrenaline, the study agreed with (Geong, 2021), where the results showed that there were no statistical differences at the level of adrenaline concentration between the group of patients (addicted) on electronic games and the control group (healthy people), where it is related to Adrenaline is directly related to a number of other hormones,

as it works parallel to cortisol to prepare the body to counter pressure, stimulates the secretion of glucacone to increase the level of glucose in the blood, and inhibits insulin secretion, which may lead to an imbalance in the long term Diabetes balance, and adrenaline reduces the effect of serotonin, which weakens the feeling of psychological comfort and promotes anxiety· Some research has also shown that gaming addicts appear to have excessive activity of the sympathetic system and frequent excretion of adrenaline, which makes them on constant alert, as some studies have indicated that excessive electronic games lead to hormonal changes related to anxiety. Attention disturbances, and adrenaline are among the most prominent of these biomarkers (KO *et al*., 2020). The correlation between adrenaline and the levels of acetylcholine asterases has indicated an inverse relationship between high levels. Adrenaline and low ACH as high sympathetic neurological activity associated with excessive immersion of electronic games may inhibit the cholinergic neurological response, leading to an imbalance between the sympathetic and parasympathetic systems. This neurological disorder may exacerbate some symptoms associated with addiction to electronic games, such as chronic anxiety, poor concentration, sleep disturbances, and rapid irritation (Jiang *et al*., 2021). It also indicated that there is a slight increase in the levels of adrenaline in addicts compared to the healthy ones, while the cortisol levels did not show much difference between the two groups, as the noticeable decrease in cortisol variation in addicts may indicate dullness or Particular inhibition of subclinical hypothalamus (HPA), which reflects a state of chronic subclinical stress· The sympathetic nervous system continues to act (as it indicates high adrenaline), while the elasticity of the adrenal gland in regulating cortisol decreases, and this defect may contribute to the emergence of psychological and behavioral symptoms such as increased anxiety, impulsivity, and sleep disturbances· Attention, a common phenomenon in behavioral addicts (Yoon *et al*., 2022)·

5- CONCLUSION

We conclude from the current study that elevated levels of both adrenaline and glucagon, along with decreased levels of cortisol, insulin, and acetylcholinesterase, can b be considered indicators of video game addiction and reactions related to stress and anxiety.

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