

## 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. Blood samples were collected from various locations in the city of samarra, including schools, recreational centers, and gaming halls designated for electronic games. A total of 90 blood samples were obtained and categorized into two groups: the control group consisting of 30 samples from adolescents and young individuals who do not play electronic games and the experimental (non-control) group, consisting of samples from adolescents and young individuals who regularly engage in electronic gaming , and 60 samples from young people and adolescents, which is the non-control group, who play electronic games. The results showed a significant difference ( $P \leq 0.05$ ) in the levels of high-density lipoprotein cholesterol and glucagon in the group of patients compared to the healthy group. There was no significant difference ( $P \leq 0.05$ ) in the levels of insulin, adrenaline and acetylcholinesterase in the group of patients compared to the healthy group.

**Key words:**, high-density lipoprotein cholesterol, glucagon, insulin, adrenaline, acetylcholinesterase.

### العلاقة بين بعض هرمونات التوتر

### لدى ممارسي الألعاب الإلكترونية في سامراء

احمد عامر حمدي ، أسماء حسن جمعه // جامعة سامراء / كلية التربية - قسم علوم الحياة  
**مستخلص:**

هدفت الدراسة الحالية إلى إيجاد العلاقة بين الإدمان المفرط على الألعاب الإلكترونية وتأثيره على هرمونات القلق والتوتر وبعض المتغيرات البيوكيميائية لدى فئات من الشباب والمراهقين. أجريت التجربة من بداية شهر أكتوبر 2024 ولغاية نهاية شهر ديسمبر 2024. تم جمع عينات الدم من مواقع مختلفة في مدينة سامراء منها المدارس والمراكز الترفيهية وقاعات الألعاب المخصصة للألعاب الإلكترونية. تم الحصول على 90 عينة دم، وتصنيفها إلى مجموعتين: المجموعة الضابطة، وتضم 30 عينة من المراهقين والشباب الذين لا يلعبون الألعاب الإلكترونية، والمجموعة التجريبية (غير الضابطة)، وتضم عينات من المراهقين والشباب الذين يمارسون الألعاب الإلكترونية بانتظام، وتضم 60 عينة من الشباب والمراهقين، وهي المجموعة غير الضابطة، الذين يلعبون الألعاب الإلكترونية. أظهرت النتائج وجود فرق معنوي ( $P \leq 0.05$ ) في مستويات كوليسترول البروتين الدهني عالي الكثافة والجلوكاجون لدى مجموعة المرضى مقارنةً بالمجموعة السليمة. لم يكن هناك فرق معنوي ( $P \leq 0.05$ ) في مستويات الأنسولين والأدرينالين والأستيل كولين استيريز لدى مجموعة المرضى مقارنةً بالمجموعة السليمة.

**الكلمات المفتاحية:** كوليسترول البروتين الدهني عالي الكثافة، الجلوكاجون، الأنسولين، الأدرينالين،

الأستيل كولين استيريز.

## 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 levels of high-density lipoprotein cholesterol (HDL), 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 Hypothalamic pituitary Adrenal (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).

## **Materials and methods**

### **Study design:**

Blood samples were collected from male youth and adolescents aged 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, who are the estimated control group, and 60 samples youth and adolescents addicted to electronic games.

### **Standards and tests studied**

#### **Estimation of high-density lipoprotein cholesterol activity in serum**

The reaction principle is based on the precipitation of chylomicrons, low-density lipoproteins, and very low-density lipoproteins with phosphotungstic acid, in the presence of magnesium ions, by means of a centrifuge. High-density lipoproteins remain dissolved in the upper clear liquid, and thus it is possible to measure their concentration in this solution by adding (50  $\mu$ l) of blood serum, standard solution, and distilled water in three clean, dry tubes. (1 ml) of the working solution, Cholesterol Enzymatic Solution, was added to each tube. The tubes were shaken and then placed in a water bath at a temperature of (37) C for (5) minutes. The absorbance was read at a

wavelength of (500 nm) using a spectrophotometer, and the concentrations of high-density lipoproteins were calculated (Warnick and Wood, 1995).

#### **Estimating the effectiveness of glucagon in serum.**

The concentration of glucagon in serum was measured using a glucagon-based kit from Shanghai, China. The determination was performed using the Enzyme Linked Immunosorbent Assay (ELISA) method. 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 (Kobayashi *et al.* , 2007).

#### **Estimation of insulin activity in serum.**

Serum insulin concentration was measured using a Shanghai insulin assay kit. The determination was per-

formed using 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 (Youn *et al.*,2004).

#### **Estimation of adrenaline activity in serum.**

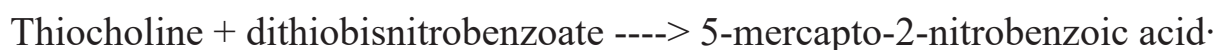
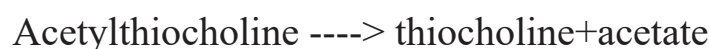
The concentration of adrenaline in serum was measured using a adrenaline-based kit from Shanghai, China. The determination was performed using ELISA technique. The wells were coated with adrenaline antibodies, then the sample or standard containing antigen was added. Horseradish peroxidase (HRP) was 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 (Murphy *et al.* , 1992).

### **Estimate the efficacy of acetylcholine esterase in the blood serum.**

Serum acetylcholinesterase concentration was measured using the Ellman method (Ellman *et al.*, 1961). The Ellman procedure is commonly used to determine acetylcholinesterase and monitor its hydrolysis by acetylcholinesterase (AChE) or butyrylcho-

linesterase in the laboratory. The Ellman 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 Ellman'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. The reactions are based on:



### **Statistical Analysis:**

The results obtained from the current study were analyzed using the SPSS statistical program, and the T-Test test was applied at 0.05 indication level to determine the extent of the meaning of the differences between aggregates.

### **Results**

The results shown in Table (1) indicate a significant difference in high-density lipoprotein cholesterol in

the group of addicts ( $36.218 \pm 7.561$ ) compared to the healthy group ones ( $32.783 \pm 8.027$ ). The Glucacon concentration may indicate a significant difference ( $P \leq 0.05$ ) in the group of addicts ( $625.361 \pm 76.946$ ) compared to the healthy group ( $565.256 \pm 79.622$ ). The results of the insulin concentration indicate that there is no significant difference ( $P \leq 0.05$ ) in the group of addicts ( $11.339 \pm 2.868$ ) compared to the group of healthy people ( $12.313 \pm 3.233$ )

**Table (1)** the concentration of high-density lipoprotein cholesterol, Glucacon and Insulin in the studied groups:

Group	high-density lipoprotein cholesterol	Glucacon	Insulin
Addicts	(36.218±7.561)	(625.361±76.946)	(11.339±2.868)
Healthy people	(32.783027.8±)	(565.256±79.622)	(12.313±3.233)

The results shown in Table (2) indicate that there is no significant difference ( $P \leq 0.05$ ) in the concentration of adrenaline in the addicted group ( $24.957 \pm 5.342$ ) compared to the group of healthy people ( $24.890 \pm 3.942$ ).

The results of the effect of acetylcholine choline styrease indicate that there is no significant difference ( $P \leq 0.05$ ) in the addicted group ( $418.275 \pm 104.173$ ) compared to a group of healthy people ( $419.607 \pm 131.229$ ).

**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 high-density lipoprotein cholesterol concentration between the group of addicts and the healthy control group. high-density lipoprotein cholesterol levels have rose 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 addicts and the control group (healthy). The insu-

lin 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 high-density lipoprotein cholesterol secretion, and it has been proven that high high-density lipoprotein cholesterol 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 relationship between HDL and insulin is well documented in the scientific literature. HDL is an indicator of heart health and good metabolism and is associated with improved insulin sensitivity. HDL contributes to enhancing tissue response to insulin and reducing inflammation, which is reflected in stable glucose levels. However, the observed slight increase in HDL and slight decrease in insulin in addicts may indicate complex changes related to the unhealthy lifestyle resulting from excessive video game use. In cases of addiction, behavioral patterns clearly change, with decreased physical activity, increased screen time, and associated changes in sleep and eating patterns, all of which directly impact metabolism (Joseph and Golden, 2021). A study has shown that prolonged screen time is associated with lower HDL levels and insulin imbalance, which increases the likelihood of metabolic syndrome developing at an ear-

ly age. The relationship between HDL and insulin is well documented in the scientific literature. HDL is an indicator of heart health and good metabolism and is associated with improved insulin sensitivity. HDL contributes to enhancing tissue response to insulin and reducing inflammation(Heinrich *et al.*,2021) which is reflected in stable glucose levels. However, the observed slight increase in HDL and slight decrease in insulin in addicts may indicate complex changes related to the unhealthy lifestyle resulting from excessive video game use. In cases of addiction, behavioral patterns clearly change, with decreased physical activity, increased screen time, and associated changes in sleep and eating patterns, all of which directly impact metabolism. A study has shown that prolonged screen time is associated with lower HDL levels and insulin imbalance, which increases the likelihood of metabolic syndrome developing at an early age(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 adren-

aline 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).

### conclusions:

The present study demonstrates that elevated levels of both adrenaline and glucagon and high-density lipoprotein cholesterol, along with decreased levels of, insulin, and acetylcholinesterase, can be considered indicators of video game addiction and reactions related to stress and anxiety.

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