

# Stress Perception and Stress Response against Internet Psychological Addiction (IPA) on Adolescents (Psychoneuroimmunology Approach)

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## Abstract

**Background:** Phenomenon of IPA in long-term effect is dominated by negative effect that has risk in undergoing stress. Stress perception will activate the change of physiology system in the body in form of stress response through activating *Hypothalamic-Pituitary Adrenocortical* (HPA) that will increase cortisol production. **Purpose:** investigate how the correlation between stress perception and stress response against IPA for adolescents based on psychoneuroimmunology (PNI) concept. **Method:** This research used cross-sectional design. There were 39 Senior High School students, who were indicated to undergo internet psychological addiction and they were as the sample of this research. **Result:** There were 39 students in six Senior High Schools in Makassar, Indonesia, who were identified to undergo IPA. Stress perception in most of adolescents who underwent IPA was high (61.5%), particularly for adolescent who underwent high internet addiction, and so as the stress response on IPA, which was also high (53.8%), which described health quality for IPA. **Conclusion:** there was a significant correlation between stress perception and stress response on adolescent who underwent IPA based on psychoneuroimmunology approach.

**Keywords:** internet psychological addiction, adolescents, psychoneuroimmunology, stress perception, stress response

## Introduction

Psychoneuroimmunology is an integrated concept regarding function of immune regulation for defending homeostasis. PNI concept views on the correlation among stress, immune system, and health. Stress is consisted of stress-perception and stress response<sup>1</sup>. Stressor is a cause for stress-perception and stress response<sup>2</sup>. Ader in Putra<sup>3</sup> showed that regulation of immune system or immunoregulation, which firstly was believed as autonomous process, was proven to be influenced by nervous system performance through learning proses that was occurred in central nervous system. Thus, it was proven unautonomous<sup>3</sup>.

Limitation of PNI according to Ader-Cohen in Putra<sup>3</sup>, related with behaviour-neuroendocrine-immune system. Definition of stress that was stated was closer with Selye in Putra<sup>3</sup> and it was as non-specific response of the body to any demand with biological concept. However,

definition of stress in PNI also used Eric Linderman-Gerald Caplan concept as psychological state involving cognition and emotion, which gave limitation of stress concept in psychological side, whether, psychic stress was defined as cognition that was learning process result or stress perception which could be observed based on modulation of immune response (stress response)<sup>3</sup>.

The criteria of IPA are: excessive using internet (>6 months); making internet as a dominant activity (salience); undergoing internal and external conflict; appearing euphoria while being able to access internet (mood modification); increasing needs to access internet (tolerance), uncomfortable feeling when the use of internet was limited (withdrawal)<sup>4-7</sup>.

Phenomenon of IPA on adolescents has become global epidemic. Research result regarding IPA in long-term effect is dominated by negative effects which have risk to undergo depression, anxiety, aggressive behavior,

social isolation, psychiatric symptoms, interpersonal problems and stress<sup>8-10</sup>. Even, negative effect of IPA is as dangerous as alcohol and narcotics addiction<sup>11,12</sup>

Phenomenon of internet addiction will influence other activities and this will impact to adolescent's physical, cognitive, socio-emotional, and spiritual development disorders that contribute to personal distress (dangerous and destructive stress)<sup>13,14</sup>

According to conducted observation, it was found low productivity on adolescent who underwent IPA in Makassar. Interview result with students in several Senior High Schools and IPTEK-KOM research<sup>15</sup> showed that they used internet excessively and they made the internet as dominant activity in daily life (Salience) until their time was wasting more only for accessing internet which was not for learning process.

Nevertheless, if the internet was used for searching information for completing homeworks or school tasks, the advantages of internet itself could raise enthusiasm for learning process (eustress), but if it was used excessively, it could cause distress. In other words, internet could cause the students did not want to learn anymore because they could not concentrate well, they were easy to forget (low memory), difficult to understand, and as the impact, they could have poor score at school, and also could have poor sleep quality. This would impact to their learning achievements at school, which caused high academic stress<sup>16</sup>.

Internet could not be separated from adolescent's life. Almost all their needs could be fulfilled by internet<sup>17</sup>. There were pleasant experiences while accessing internet (mood modification) that was triggered by dopamine spending which caused them would repeat the experience until their time intensity that was needed to access the internet added (tolerance). Although the time intensity to access the internet was controlled, they would try to repeat it with longer intensity (relapse) because they had felt pleasant experience before. However, when they was hindered to access internet, they would feel unpleasant such as annoying, angry, and restless (withdrawal). When the internet had dominated life activity, it would cause imbalance among biological, psychological, and social needs, thus, it would cause conflict either internal or external conflict, even, it could cause aggressiveness to the adolescents<sup>18</sup>.

Adolescent's characteristic which was in identity crisis stage, tended to have high curiosity<sup>19,20</sup> and this

was really supported by socio-cultural condition in urban area that facilitated ease to access internet in several public facilities. Besides, it was also supported by booming smartphone market. Even, rapid information and telecommunication systems development also had the potency to facilitate the occurrence of IPA.

In addition, referring to psychoneuroimmunology paradigm, the stressor (impact of internet addiction on physical, cognitive, socioemotional and spiritual development aspects) would be responded by brain cognitively in stress perception (how coping or adolescent's self-adjustment cognitively and behavior in facing the impact of internet addiction). As we know that, stress perception is an ability to understand or conceptualize accepted stressor that results a cognition (understanding) which can cause stress response in modulation of immune response<sup>3</sup>. A condition that is stated as stressor by the brain will cause a stress and the change of physiological, psychological, and behavioral aspects.

Lazarus & Cohen assumed that stress involved transaction between the individual and other worlds from him/herself<sup>21</sup>. Primary appraisal is individual first assessment against the occurrences either in positive side, negative side, or netral side which can cause stress (such as incomplete homework due to they are too busy to access internet, school task is assumed as difficult thing that can cause stress). Secondary appraisal is an assessment against resources or self-ability in confronting an occurrence or intimidation. The adolescents will respond stress in different way, they will search information directly, they will not do nothing or will use their owned coping style as their defense efforts.

Perception process is consisted of selection, organization, and stimulus interpretations which are accepted by human sense until they become meaningful things<sup>22</sup>. Every individual will perceive a stress differently. If it is valued as negative thing by repeating the behavior without trying to correct it well, it will cause a problem for them.

Then, stress perception will activate the change of physiological systems in stress response through activating HPA that can increase production of cortisol. Hence, it impacts to development of health problem. In long-term effect, cortisol can cause the decrease of immune function and nerve damage in hippocampus. This change will increase infection, psychiatric problem,

and loss of concentration and memory<sup>23</sup>.

This reseach was conducted in order to investigate how the correlation between stress perception and stress response against IPA on adolescent based on psychoneuroimmunology concept.

### Method

This research utilized cross-sectional design. Locations of sample collection in this research were in six Senior High Schools in Makassar from August 2018 until February 2019. The population was all of twelfth grade students in Senior High School who were detected to undergo internet psychological addiction and there were 244 students. The sample size was 39, selected by purposive sampling. Data were collected using IPA questionnaire<sup>25</sup>, serum cortisol levels measurement (Elisa) and stress perception questionnaire. Afterwards, the research result was analyzed by using Chi-square in order to observe the comparison among variables, then, it was conducted correlation analysis in order to investigate the correlation between stress perception and stress response.

### Findings

IPA level on most of adolescents was high (Figure-1).



Figure-1. Distribution of IPA Level

The most of stress perception level was high (Figure-2).



Figure-2. Distribution of Stress Perception Level

Table 1 showed that there was no significant difference between stress perception score and IPA (p=0.097).

Table 1. Comparison of Stress Perception Score based on IPA Level

IPA	Stress Perception Score			p-value
	Mean	SD	Median	
High	55.10	2.83	55	0.097
Low	53.26	3.88	53	

The Stress Response Level on most of adolescents was high (Figure-3).

Figure-2. Distribution of Stress Response Level

Table 2 showed that there was significant difference between stress response and IPA (p=0.000) and significant difference between stress response and stress perception (p=0.016).

Table 2. Comparison of Stress Response based on IPA Level and Stress Perception

IPA	Stress Response Score			p-value
	Mean	SD	Median	
High	23.98	1.29	21.93	0.000
Low	12.20	4.01	11.60	
Stress Perception				
High	21.54	1.26	16.29	0.016
Low	12.97	5.80	11.60	

### Discussion

#### Stress Perception

Most of stress perception on IPA was high. This condition was occurred more on female adolescents who accessed social network by using cellphone. Although it was not proven that there was a significant correlation between stress perception and respondent's characteristic, the activity of accessing internet since in early age was used for accessing others which did not have any advantages for learning process.

Adolescents were in identity crisis stage. They tended to have high curiosity and they were easy to be influenced by their peer friends<sup>20</sup>. The adolescents

tended to have high confidence to access internet, but unstable, thus, they had not been able to select useful internet activities.

Phenomenon of internet addiction would influence other activities that impacted to imbalance in fulfilling other needs and contributing to personal distress or dangerous stress and could damage the adolescent development in the future<sup>13,14</sup>.

Several researchers proved that internet addiction in long-term effect was dominated by negative impacts, such as depression, aggressive behavior, mental disorders, and stress<sup>25-29</sup>. In psychoneuroimmunology concept, stress is divided by two kinds, which are eustress and distress<sup>3</sup>. Eustress is stress that is needed to advance but if it is excessive, it will be distress.

### Stress Response

Most of stress response on adolescent was high. The stress condition on IPA gave description that cortisol, product from hormonal reaction of the body due to stress, had spread into the body. Regulation of cortisol secretion was controlled by three organs, which were hypothalamus secreted Corticotrophin Releasing Hormone which would stimulate the anterior pituitary gland to secrete Adrenocorticotrophic Releasing Hormone which afterwards, it would stimulate adrenal cortex to secrete cortisol. Cortisol had important role in metabolism of protein and fat through increasing gluconeogenesis and it also had role in the process of adaptation against stress. In gluconeogenesis, it was occurred the increase of glucose secretion in the liver and changes in non-carbohydrate sources (amino acids) to be carbohydrates. Cortisol also caused lipolysis, thus, releasing free fatty acid increased, and it would be occurred centripetal fat deposits<sup>30</sup>. Other functions of cortisol were regulating arteriolar tone and maintaining blood pressure (stimulating angiotensin II secretion), increasing glomerular filtration rate, water excretion, potassium excretion, sodium retention, and suppressing calcium uptake in renal tubules and intestines. This condition was caused by significant permissive effect of cortisol against other hormone activities. Epinephrine was one of hormone types which its activity was influenced by hormone level of cortisol. Moreover, cortisol must be in sufficient quantities for epinephrine in order to cause vasoconstriction. In stress condition, human body would increase epinephrine secretion until 300 times greater from normal level and it was depended

on type and intensity of stress stimulus<sup>30</sup>. Cortisol increased epinephrine activity, thus, it was occurred the increase of heart rate and blood pressure.

The role of cortisol in helping the body to overcome anxiety or stress, and it was estimated that it related with its metabolic effect. Cortisol had metabolic effect which was increasing concentration of blood glucose by using protein and fat from the body. A logical assumption stated that the increase of glucose, amino acids, and fatty acids supply was available to be used when it was needed<sup>30</sup>.

### Correlation between Stress Perception and Stress Response

Stress perception in overcoming the impact of internet psychological addiction that was occurred would be responded by Hypothalamus-Pituitary-Adrenalin (HPA-axis), hence, it caused the cortisol level increased. If stressor that was accepted by hypothalamus was strong, the CRF that was secreted would increase more and more. Thus, stimulation that was accepted by pituitary also increased and cortisol secretion by the adrenal gland also increased. If the emotional condition had been stable, coping mechanism became positive, signal in the brain would hinder the release of CRF<sup>31-32</sup>. Due to stress, cortisol secretion could increase until 20 times greater. Stress was main factor in causing relapse in all addictions<sup>33</sup>.

The use of internet excessively on IPA chronically would cause change of sensitivity in nervous system. Adolescents who were in condition of negative emotion or anxiety would increase cortisol level in the blood. Almost each response in the body, such as stress, could increase cortisol even in 20 times greater. The ability in regulating stressor until resulting different perception was really depended on their condition and perception against accepted stress<sup>34</sup>. If their stress coping was good although there was stressor, the susceptibility against health problem could be reduced<sup>35</sup>.

### Conclusion

When the adolescents who underwent IPA was in stress condition, they could result perception against stress that would stimulate HPA axis, thus, CRF secretion by hypothalamus would increase. Then, it would be followed by the increase of ACTH by pituitary and the increase of cortisol secretion by adrenal gland.

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**Ethical Clearance-**Yes

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