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Emotional Regulation Training, internet addiction disorder, and the Moderating Role of Brain-Behavioral Systems: Examination and analysis

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Abstract--The purpose of the current study was to examine the efficacy of emotional regulation training on Internet addiction disorder with the moderating role of brain-behavioral systems. The current research is a quasi-experimental study that employs with a pre-test/post-test design with a control group and a follow-up period for its purposes. The statistical population of the research were Internet using students of the second educational level in Islamshahr in the second half of 2021(15-20 years old girls). The research participants were selected using a convenience purposive sampling and were then randomly assigned to three experimental groups (45 people) and three control groups (45 people). Revised Reinforcement Sensitivity Theory Questionnaire (r-RST), Internet Addiction Inventory and Emotional Regulation Training scale were used to collect the data, which were then analyzed using SPSS v. 22. Findings: The findings indicated that

emotional regulation training can significantly alleviate Internet addiction in three groups of behavioral activation system, brain inhibition and fight-flight-or-freeze response systems. Conclusion: The results of the study support the notion of using emotional regulation training to reduce internet addiction disorder in students.

Keywords--*Internet addiction, emotional regulation training, brain-behavioral systems, Reinforcement Sensitivity Theory, Behavioral Activation system, Brain Inhibition, fight-flight-or-freeze systems.*

Introduction

Technology has brewed a plethora of breakthroughs in recent decades, yet no field can boast the dominance of IT and computer sciences, the Internet being its flagship product (Kurniasanti et al., 2020). In recent years, the development of the Internet has brought a lot of benefits in our society. However, it also causes the Internet Addiction Disorder (IAD) problems, which is also named as Pathological Internet Use (PIU; Di et al., 2019). Excessive use of the Internet can lead to Internet addiction (Kuss and Griffiths, 2014). The increasing growth of Internet addiction and its consequences has made this addiction reportedly more common than all behavioral addictions (Sariyska et al., 2017). Excessive users of internet often frequently procrastinate, even falling trap to feelings of anger, anxiety, and depression when lacking access to the Internet (Piri et al., 2019). Internet addiction is a distinct mental disorder in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), sharing many similar characteristics with substance-less addictions like pathological gambling (Einipour et al., 2021).

Another highly sought-after predictor of Internet addiction is emotion regulation (Yildiz and Psychology, 2017). Emotion regulation strategies not only involve awareness and evaluation of human emotional states, but also include processes that are pivotal to understanding and influencing one's emotions. People are perceived to be capable of avoiding any negative or unwanted experiences should they be proficient in using these strategies, through which they can control their emotions more effectively, even when stimuli are intense, so as not to engage in pathological Internet use (Trumello et al., 2018). In another study, Yildiz (2017) examine the predictive effect of emotion regulation on Internet addiction, the results of which indicated that struggle to maintain emotion regulation strongly predicts high levels of Internet addiction. People with Internet addiction also face difficulties in paying attention to emotional information, labeling or differentiating emotions and emotional adjustments in interpersonal relationships. These difficulties often force individuals to resort to incompatible adaptive strategies in facing stressful life situations (Yen et al., 2021).

Academics widely argue that cognitive and emotional actions are major functional parts of one's nervous and psychological systems. Among the theories that has been popularized for explaining individual differences and psychopathology is Gray's Reinforcement Sensitivity Theory (Gray, McNaughton, 2000), which states that people are born with different levels of sensitivity of brain systems, and

although determined genetically and biologically, are influenced by environmental factors and learning processes throughout life (Hundt et al., 2017). Gray's theory further establishes that different brain structures activate three basic motivational systems that interact with behavioral reinforcement. In the latest revision of the model, the behavioral activation system is responsible for the reward/absence of punishment reactions and leads to positive emotions and behavioral tendencies. Carver and White (2008) consider this system to include three sub-sets, namely (a) drive, (b) reward responsiveness, (c) fun-seeking fun. The second system is the behavioral inhibition system (BIS) which is a neuropsychological system that predicts an individual's response to anxiety-relevant cues in a given environment. This system is activated in times of punishment, boring things, or negative events (Fayazi et al., 2015). Moreover, the fight-flight-or-freeze system responds to all annoying (either conditional or non-conditional) or punishment related stimuli, thereby perceived to be highly affiliated to fear (Morton and White, 2016). Previous research has highlighted the role of brain-behavioral systems in emotional regulation difficulties in the form of various psychological behaviors and disorders, particularly those of addictive nature. That is, the sensitivity of each of the brain-behavioral systems in the form of sensitivity to reward, sensitivity to punishment and threat in one's behavioral inhibition and activation can play an effective role in the formation of Internet addiction disorder (Yen, Fang, 2018). Among the mechanisms that is evidenced by research to be involved in moderating the sensitivities of the brain-behavioral system and modulating the arousal of the brain regions is emotion regulation (Nazari et al., 2020). Emotion regulation can change the process of emotion generation through the cognitive reappraisal strategy in areas of brain structures thought to be sources of emotion regulation processes, that is, lateral prefrontal cortex (LPFC), medial prefrontal cortex (MPFC), dorsal anterior cingulate cortex (dACC), lateral orbitofrontal cortex (LOFC), leading to modulation of emotional arousal in various brain areas, namely amygdala, insula, striatum, and lateral orbitofrontal cortex (LPFC). These findings indicate that difficulty in emotion regulation can be associated with a reduction of performance in these structures or an increase in that of the reappraisal structures (Akbari, 2018).

Emotion regulation is a special form of self-regulation and a process through which people consciously or unconsciously regulate their emotions in order to properly respond to their environmental demands. Emotion regulation can include any type of coping strategy (adaptive or maladaptive) that an individual might employ in case of facing stressful situations (Piri et al., 2019). The educational approach of emotional regulation tries to seeks to provide conditions for the person to become aware of experiences, needs and emotions during the therapeutic routine. One of the most important emotional regulation strategies is identifying anxiety-provoking situations, awareness and acceptance of emotions, and cognitive reappraisal, which gives people with internet addiction the opportunity to stop tendency-avoidance conflicts caused by the stimulation of brain-behavioral systems through emotional regulation educational strategies, the ultimate aim of which would be alleviating pathways to internet addiction. Therefore, the purpose of the current research is to examine whether emotion regulation training is effective on Internet addiction with the moderating role of brain-behavioral systems.

Research population and sampling method

The current research is a quasi-experimental study that employs with a pre-test/post-test design with a control group and a follow-up period for its purposes. The statistical population of the research were Internet using students of the second educational level of Shahid Ma'refet Conservatory in Islamshahr (15-20 years old girls). The research participants were selected using convenience purposive sampling. J*Power was used to estimate the total number of samples required. Then, the standard Z score of each participant in the Internet Addiction Questionnaire and the revised Reinforcement Sensitivity Theory Questionnaire was calculated, following which participants with standard scores higher than 1 were selected as the target sample. The participants were then randomly assigned to three experimental groups (45 people) and three control groups (45 people). The authors used the following inclusion criteria for the purposes of the study: volunteers being aged between 15 and 20 years, participation in pre-tests of Internet addiction and reinforcement sensitivity theory scale, obtaining the required standard Z scores (standard scores higher than 1), not suffering from any chronic medical disease, lack of severe mental disorders based on DSM-5 clinical interview and MMPI test (short form), participation in tests and treatment sessions. Furthermore, lack of desire and interest to participate in research and treatment sessions, post-test examinations, or follow-up routine were the exclusion criteria of the research. Furthermore, the ethical considerations exercised by the authors were obtaining informed written consent to participate in the research and the confidentiality of the volunteers' information. Following the preparation of the emotional regulation educational model package, the opinions of 7 psychology professors, expert in emotional regulation, regarding the communication methods of therapy sessions, the number and duration of sessions were inquired to confirm the content validity of the therapy package. The content validity coefficient for all items was equal to 0.75. Based on the results, the corresponding coefficients for the sessions were in the range of 0.71 to 1.00, which indicates that the therapeutic sessions have content validity. The emotional regulation training model package was taught to the experimental group in 7 sessions of 60 minutes, twice a week. The participant then entered the post-test stage following the completion of the intervention. The post-test consisted of completing the previous questionnaire. Two months after the end of the course, the participants were again asked to complete the same questionnaire for the purposes of determining the follow-up effect. The data obtained from the research were described first by using descriptive statistics indicators such as mean and standard deviation, and were hence analyzed using inferential statistics tests of univariate analysis of covariance to examine the difference between the two experimental and control groups in the post-test and follow-up stage. Furthermore, Mauchly's sphericity test, Greenhouse Geisser, Bonferroni's post-hoc tests were employed as required.

A briefing of the emotional regulation educational model sessions based on the Gross emotional regulation theory (ERT), emotional schema-therapy (EST) and Emotional Transformation Therapy (ETT) focused on Internet addiction.

Session 1: Getting to know the goals of the meetings		Purpose: familiarizing the group members with each other and start the mutual relationship between the group leader (psychologist) and the members Assignments: identifying and naming and labeling emotions, distinguishing between different emotions
Session 2: Select position		Purpose: recognizing emotions in physical and psychological states Assignments: Identifying emotionally provoking situations
Session 3: Adjustment position	of	Purpose: getting to know primary emotions and secondary emotions Assignments: group members should identify more of the emotions they experience in everyday relationships.
Session 4: Allocation attention	of	Purpose: change of attention, that is, to direct their attention to threatening clues or to avoid them. Assignments: Clarifying thoughts and painful experiences, identifying and recording disturbed emotions that cause rumination.
Session 5: Cognitive appraisal	re-	Purpose: to change cognitive appraisals; the underlying assumption of this stage is that situations do not directly affect emotions, and cognitive processes mediate the path between situations and emotions. Cognitive re-appraisal is considered as a strategy focused on the antecedents. Assignments: identifying negative evaluations that affect emotions and positive re-appraisals for emotional self-regulation
Session 6: Adjustment responses	of	Purpose: changing the physiological-behavioral and experiential consequences of emotion after generating emotion Assignments: exposure to habituation of emotional arousing stimulus and emotional change through cognitive re-appraisal
Session 7: Re-evaluation and Troubleshooting		

Measuring instruments

Revised Reinforcement Sensitivity Theory Questionnaire (r-RST)

This questionnaire was compiled by Jackson (2009) based on the revised version of Gray's Reinforcement Sensitivity Theory and has 30 items. This questionnaire covers three behavioral systems of the brain, which include the subscale of the behavioral activation system (r-BAS), the behavioral inhibition system (r-BIS) and the fight, flight, and freeze system (r-FFFS). The inventory has 5 sub-scales in total, each comprised of 6 items total. Items are scored on a five-point Likert scale (ranging from 1 for completely agree to 5 for completely disagree). Jackson calculated the reliability of the questionnaire using Cronbach's alpha method for each of system as follows: 1.89 for behavioral activation system, 1.71, and 1.74 for the fight-flight-freeze. Hasani et al. examined the validity of the Iranian version

of this scale in terms internal consistency, correlation of items, test-retest, factor analysis, correlation between subscales, and criterion validity, with Cronbach's alpha ranging from 1.72 to 1.88, retest coefficients from 1.14 to 1.78 and the correlations of the total items between 1.18 to 1.28 (Fayazi, 2016).

Internet Addiction Test

The Internet Addiction Test (IAT) is a 20-item self-assessment tool developed by Young. It is scored on a Likert scale, responses ranging from always (score 5) to never (score zero). The range of scores for this test is from zero to 100. The higher the score of the respondent, the greater his/her dependence and addiction to the Internet. This questionnaire is standard, as its validity and reliability have been established in previous studies, with a Cronbach's alpha of 0.90. The Persian version of this scale has also been used in Iran and its reliability has been confirmed by Nastizai with Cronbach's alpha of 0.81 and Ghasemzadeh with Cronbach's alpha of 0.88. furthermore, its internal consistency was calculated to be 0.88, while the corresponding test-retest coefficient was 0.72 (Piri et al., 2020).

Research findings

Table 1 shows the mean and standard deviation of Internet addiction of the experimental and control groups, separated by measurement stages (pre-test, post-test and follow-up).

Table 1: Mean and standard deviation of Internet addiction of research participants in groups

Testing stage	Group	Descriptive statistics	
		Mean	SD
Pre-test	experimental group / activation system	45.20	5.401
	experimental group / inhibition system	43.33	2.582
	experimental group / fight-or-flight system	44.07	3.634
	control group / activation system	43.20	2.859
	control group / inhibition system	43.80	3.843
	control group / fight-or-flight system	46.35	6.390
Post-test	experimental group / activation system	36.20	2.178
	experimental group / inhibition system	32.53	1.506
	experimental group / fight-or-flight system	35.40	1.183
	control group / activation system	43.07	2.963

	control group / inhibition system	47.73	4.590
	control group / fight-or-flight system	46.27	6.041
Follow-up	experimental group / activation system	36.27	2.282
	experimental group/inhibition system	32.67	1.633
	experimental group / fight-or-flight system	35.47	1.246
	control group / activation system	43.13	2.93
	control group / inhibition system	43.82	4.586
	control group / fight-or-flight system	46.33	6.008

Table 2: The results of between-subject effects of post-test univariate covariance for Internet addiction

Source of change	Sum of squares	of DoF	F-value	Sig. level	Impact coefficient	Statistical power
Group	2082.975	5	71.262	0.001	0.811	0.999
Pre-test	561.321	1	96.019	0.001	0.536	0.999
Error	485.212	83	-	-	-	-
Total	143996.000	90	-	-	-	-

Table 2 shows the results of the ANCOVA of Internet addiction in the intervention groups and the control group, which indicates that by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental groups (Sig=0.001, F=71.262). Also, the effect size of the emotional regulation training on Internet addiction was 0.811.

Table 3: The results of between-subject effects of post-test univariate covariance for Internet addiction in the activation system group

Source of change	Sum of squares	of DoF	F-value	Sig. level	Impact coefficient	Statistical power
Group	391.142	1	71.141	0.001	0.725	0.999
Pre-test	40.885	1	7.436	0.011	0.216	0.748
Error	18.449	27	-	-	-	-
Total	47667.000	30	-	-	-	-

Table 3 shows the results of the ANCOVA of Internet addiction in the behavioral activation system group and the control group, which indicates that by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group (Sig=0.001, F=71.141). Also, the effect size of the emotional regulation training on Internet addiction was 0.725.

Table 4: The results of between-subject effects of post-test univariate covariance for Internet addiction in the inhibition system group

Source of change	Sum of squares	of DoF	F-value	Sig. level	Impact coefficient	Statistical power
Group	884.321	1	186.693	0.001	0.874	0.999
Pre-test	198.774	1	41.964	0.001	0.608	0.999
Error	127.893	27	-	-	-	-
Total	44892.000	30	-	-	-	-

Table 4 shows the results of the ANCOVA of Internet addiction in the behavioral inhibition system group and the control group, which indicates that by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group (Sig=0.001, F=186.693). Also, the effect size of the emotional regulation training on Internet addiction was 0.874.

Table 5: The results of between-subject effects of post-test univariate covariance for Internet addiction in the FFFS group

Source of change	Sum of squares	of DoF	F-value	Sig. level	Impact coefficient	Statistical power
Group	585.94	1	110.585	0.001	0.804	0.999
Pre-test	387.741	1	73.127	0.001	0.730	0.999
Error	143.063	27	-	-	-	-
Total	51437.00	30	-	-	-	-

Table 5 shows the results of the ANCOVA of Internet addiction in the fight-flight-or-freeze system group and the control group, which indicates that by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group (Sig=0.001, F=110.585). Also, the effect size of the emotional regulation training on Internet addiction was 0.804.

Table 6: The result of Mauchly's sphericity test for Internet addiction

Variable	Mauchly's sphericity test	Chi-square test	DoF	Sig. level
Internet addiction	0.029	293.251	2	0.001

According to the results of Mauchly's sphericity test, the significance level for internet addiction is 0.001, dismissing the assumption of sphericity. That is, the homogeneity of the covariance matrix was not confirmed, making the F statistical model inapplicable for the purposes of the study. As such, a more conservative test, namely, the Greenhouse–Geisser correction, was used to examine the within-subject effects of the treatment, the results of which are shown in Table 7.

Table 7: Results of within-subject and between-subject repeated measures ANOVA for Internet addiction in three implementation stages

Dependent variable	Source of change	F-value	Sig. level	Impact coefficient	Statistical power
Internet addiction	Time	212.160	0.001	0.716	0.999
	Group	17.317	0.001	0.508	0.999
	Time*Group	41.078	0.001	0.710	0.999

The results of table 7 showed that the effects of emotion regulation training on reducing Internet addiction were significant (Sig=0.001 and F=17.317). The results from the pairwise comparison of the mean test stages (pre-test, post-test and follow-up) of Internet addiction are shown in Table 8.

Table 8: Results of the Bonferroni post-hoc test for Internet addiction

Dependent variable	Stage	Mean	Difference of stages	Mean difference	Sig. level
Internet addiction	Pre-test	44.36	Pre-test/post-test	4.822	0.001
	Post-test	39.53	Pre-test/follow-up	4/744	0.001
	Follow-up	39.61	Post-test/follow-up	-0.078	0.066

Bonferroni's follow-up test was used to the stage in which there is a significant difference in the score of internet addiction. Findings from Table 8 show that the mean difference between pre-test and post-test (intervention effect) and the average difference between pre-test and follow-up (time effect) is greater and more significant than the mean difference between post-test and follow-up (intervention stability effect). This indicates that emotion regulation training had an effect on Internet addiction in the post-test phase, while being also able to maintain the effect in the follow-up phase. Also, since the obtained results did not specify the experimental group (namely, brain-behavioral systems of activation, inhibition and fight-flight-freeze) with the most significant effect in the post-test phase was significant or which experimental group was significant. has been or not, therefore, Bonferroni's post-hoc test to investigate the difference in the effectiveness of the three experimental groups (brain-behavioral systems) on reducing Internet, the findings to which are presented in Tables 9 and 10.

Table 9: Mean post-test scores of Internet addiction in experimental and control groups

Group	Mean	SD
experimental group/activation system	35.71	0.626
experimental group/inhibition system	33.12	0.627
experimental group/fight-or-flight system	35.57	0.625
control group/activation system	43.73	0.628
control group/inhibition system	44.05	0.625

control group/fight-or-flight system-	45.02	0.637
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Table 9 shows the mean post-test scores of Internet addiction in experimental and control groups. Table 10 shows the results of Bonferroni post-hoc test on the effectiveness of the various intervention groups.

Table 10: Pairwise comparison using Bonferroni post hoc test of Internet addiction in experimental and control groups

Variable	Group I	Group J	Mean difference	Sig. level
Internet addiction	experimental group/activation system	experimental group/inhibition system	2.594	0.068
		fight-or-flight system	0.149	0.999
		control group/activation system	-8.016	0.001
		control group/inhibition system	-8.333	0.001
		control group/fight-or-flight system	-9.301	0.001
		experimental group/fight-or-flight system	-2.445	0.105
	experimental group/inhibition system	control group/activation system	-10.610	0.001
		control group/inhibition system	-10.932	0.001
		control group/fight-or-flight system	-11.895	0.001
		control group/activation system	-8.164	0.001
	experimental group/fight-or-flight system	control group/inhibition system	-8.487	0.001
		control group/fight-or-flight system	-9.450	0.001

Findings from table 10 illustrate that the average difference between the activation system group and the inhibition system group (2.594) is not significant, indicating that there is no significant difference between the moderating role of these two mechanisms, and that both have a significant effect on alleviating the complication of internet addiction disorder. Similarly, the difference between the activation systems group and the fight-flight system group (0.149) is not significant, which indicates that both groups have a similarly significant effect on reducing Internet addiction. Furthermore, the findings reveal that mean difference between the inhibition system group and the three control groups (activation system: -10.610, inhibition system: -10.932, and fight-flight: -11.895) is more than the other two test groups, which indicates that the experimental group moderated through inhibition system had a greater effect on reducing Internet addiction than other experimental groups.

Discussion and conclusion

The purpose of the current study was to study the efficacy of the emotional regulation training model on Internet addiction through the moderating role of brain-behavioral systems. The results of the research show that emotional regulation training is effective in reducing Internet addiction through the moderating role brain-behavioral systems.

Also, the results of the ANCOVA of Internet addiction in the experimental groups and the control group indicated by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group. Also, the effect size of the emotional regulation training on Internet addiction was 0.811. As such, the findings confirm the hypothesis that emotional regulation training is effective in reducing Internet addiction with the moderating role of the behavioral-brain system. The findings were consistent with the results of Einipour et al. (2021), Yan et al. (2021), Günaydın et al. (2021), Tsai et al. (2020), and Fayzai et al (2016), all of which have shown the effects of emotional regulation and brain-behavioral systems on addiction and dependence on the Internet.

the results of the ANCOVA of Internet addiction in the behavioral activation system group and the control group indicated by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group. Also, the effect size of the emotional regulation training on Internet addiction was 0.725. As such, the findings confirm the hypothesis that emotional regulation training is effective in reducing Internet addiction for the activation system group. The findings were consistent with the results of Einipour et al. (2021), Yan et al. (2021), Günaydın et al. (2021), Tsai et al. (2020), and Fayzai et al (2016), all of which have shown the effects of emotion regulation and brain-behavioral systems on addiction and dependence on the Internet. In explaining this result, it can be said that the behavioral activation system pertains to tendency-related responses. The behavioral activation system responds to conditioned stimuli of reward and lack of punishment. The function of the activation system the person to a coping strategy that seeks out for pleasant consequences, and since the use of the Internet and social networks also creates a positive motivational state, it can be examined as an application of the behavioral application system. Meanwhile, emotion regulation training helps individuals better manage these harmful emotions when exhibiting harmful fun-seeking behavioral patterns (Gruss, 1998; cited by Ghalandrazadeh and Pournaghash Tehrani, 2019).

Furthermore, the results of the ANCOVA of Internet addiction in the inhibition system group and the control group indicated by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group. Also, the effect size of the emotional regulation training on Internet addiction was 0.804. As such, the findings confirm the hypothesis that emotional regulation training is effective in reducing Internet addiction for the inhibition system group. The findings were consistent with the results of Einipour et al. (2021), Yan et al. (2021), Günaydın et al. (2021), Tsai et al. (2020), and Fayzai et al (2016), all of which have shown the effects of emotion regulation and

brain-behavioral systems on addiction and dependence on the Internet. In explaining this result, it can be said that the behavioral inhibition system is a nervous motivation system in response to new assumed threats and stimuli, and it is related to unpleasant responses in people, since the functioning of the behavioral inhibition system leads to feelings of being threatened and anxious (Morton and White, 2016). This view seeks to establish that the use of the Internet is an ineffective avoidance coping strategy of an ineffective method of avoiding anxiety. Considering that the more the brain-behavioral systems, including the inhibition system, are more sensitive and active, the more the person becomes excited in terms of emotional experiences, hindering his/her capacity of problem-solving (Cutrona and Russell, 2017). Nevertheless, emotion regulation training can affect the interaction of the behavioral inhibition system and Internet addiction and reduce the level of Internet addiction. That is, emotion regulation training helps students gain more knowledge and awareness about their emotions, especially negative emotions, and as a result, have better control over their negative emotions.

Finally, the results of the ANCOVA of Internet addiction in the fight-flight-or-freeze system group and the control group indicated by controlling the pre-test score, emotion regulation training has reduced the Internet addiction score in the experimental group. Also, the effect size of the emotional regulation training on Internet addiction was 0.804. As such, the findings confirm the hypothesis that emotional regulation training is effective in reducing Internet addiction for the fight-flight-or-freeze system group. The findings were consistent with the results of Einipour et al. (2021), Yan et al. (2021), Günaydın et al. (2021), Tsai et al. (2020), and Fayzai et al (2016), all of which have shown the effects of emotion regulation and brain-behavioral systems on addiction and dependence on the Internet. In explaining this result, it can be said that the fight-flight-freeze system of the brain refers to a kind of passive response to threats that a person might experience. It is to be highly expected that people with higher levels of sensitivity in the fight-avoidance-freeze system of the brain perceivably experience more threats in their daily life, to the response of which, they tend to avoidance coping strategies. For these people, the Internet seems to create a safe haven of trust, making them extremely dependent thereon as a process. Offering and implementing emotional regulation strategies helps students identify and moderate their negative emotions and avoid emotional dysregulation, as it simply makes them more sensitive in the fight-flight-freeze system of the brain and experience more threats in their daily life as a process, hence the vicious cycle.

Furthermore, Bonferroni post-hoc test was used to determine the stage in which internet addiction scores have between-variable significant differences using pairwise comparison. The findings indicated that the difference between pre-test and post-test means (representing the intervention effect) and the difference between those of the pre-test and the follow-up (representing the effect of time) is greater and more significant than the difference between the means of the post-test and the follow-up (intervention stability effect), which indicates that emotion regulation training is most effective in alleviating Internet addiction in the post-test phase, while readily maintain this effect in the follow-up phase. The findings are in line with those of Einipour et al. (2021), Yan et al. (2021), Günaydın (2021), Tsai et al. (2021) and Fayzai et al, (2016), all of which have established the effects

of emotion regulation and brain-behavioral systems on addiction and dependence on the Internet. In explaining this finding, emotion regulation training for students leads to an increase in awareness of understanding and acceptance of emotion, identification of anxiety-provoking situations, adjustment of emotional response and, ultimately, less inclination to Internet addiction (Dehghani et al., 2017). Furthermore, the findings of the current study indicate that focusing on emotional self-regulation enhances performance on planning, implementing and maintaining tasks, enjoying life, and increasing mindfulness of emotional needs (Diefendorf et al., 2008).

Research limitations and suggestions

Since the statistical population of the research only consisted of the students of Islamshahr, the results of the study should be applied and generalized to other groups of research interest with caution. The results showed that educational routines based on emotion regulation that consider the moderating role of brain-behavioral systems has been effective in alleviating the internet addiction disorder within students. As such, the authors suggest holding psychological workshops such as emotion regulation training in counseling centers and psychological services to deal with the complications faced by students with internet addiction disorder. Furthermore, the role of brain-behavioral systems, especially that of the inhibition system, should be examined with more care in providing solutions and adopting treatment and training programs aimed improving Internet addiction. Emotion regulation training should be further established as a complementary treatment to accelerate the reduction of students' internet addiction

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