To Evaluate the Efficacy of Internet De-addiction Programme on Perceived Stress and Autonomic Functions in Young Adults

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Abstract

Internet addiction is characterized by excessive or poorly controlled preoccupations, urges or behaviors regarding computer use and internet access that lead to impairment or distress. The present study was conducted to evaluate the efficacy of internet de-addiction programme on stress and autonomic functions in young adults.

500 young adults (age group 18-35 years), using smartphones and other gadget frequently were asked to answer Kimberley Young's Internet addiction test (IAT) questionnaire. As per their responses 31 moderates to severely addicted to internet addiction (IAT score 64.51 ± 16.94) were motivated to participate in a comprehensive internet de-addiction programme, based on repeated sessions of psychological counselling and behavioral therapy as advised by an expert clinical Psychologist. Baseline and follow up (after 6 weeks) recording of Heart rate, Blood pressure, Perceived stress scale, IAT, Autonomic functions based on frequency domain HRV were done.

There was significant increase in total power of HRV whereas significant reduction in LF/HF ratio, Perceived stress scores (PSS), Internet addiction scores and average daily mobile usage time after 6 weeks of follow up.

It can be concluded from this study that after six weeks of comprehensive sessions based on cognitive behaviour therapy and guiding for self-help approach there were significant decrease in the total daily mobile usages time, internet addiction score, perceived stress score and also simultaneous improvement in symptho-vagal tone and overall autonomic health of participants.

Key words: de-addiction programme; perceived stress; autonomic function; internet addiction test; Heart rate variability.

Introduction

In recent time internet usage has increased its popularity a lot. It has become an integral part of human lives. The internet is used for interpersonal communication, to seek information, to facilitate research, and for business activities. It is also used for gaming, watching videos, chatting for long hours, and even gambling. With 451 million monthly active internet users at end of financial year 2019, India is now second only to China in terms of internet users.[1] There have been growing concerns worldwide for "internet addiction" that is associated with excessive and inappropriate use, along with loss of control of the user.[2,3]

"Internet addiction is characterized by excessive or poorly controlled preoccupations, urges or behaviours regarding computer use and internet access that lead to impairment or distress".[4] According to Young et al.[5] internet addiction (IA) is a much broader term, and it encompasses multiple behavioural and impulse controlling difficulties. For criteria to define IA, only non-essential computer/Internet usage (e.g. non-business or non-academic use) is considered. Internet addiction is present when 5 or more of the 8 criteria in DSM-IV-TR criteria.[6] are present during the past 6 months, and mania has been ruled out as a cause. The commonly known subtypes of IA are cyber-relational, cyber-sexual, net compulsion, information overload and computer addiction. IA is considered as a disorder of impulse control because intense attachment to internet or screen seems to be real problem.

Internet addicted people are more like typical users of social networking sites, and they themselves are often not aware of their excessive usage, and that use alone induces elevated stress.[7] It is also showed that IA is positively correlated with

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stress and anxiety.[8] Similar studies demonstrated that the frequent use of internet is associated with adverse effect on social and psychological variables such as, declines in the size of social circle, persistent sad mood, loneliness.[9], lower self-esteem and life satisfaction.[10] The stress has its profound effect on both wings of autonomic nervous system (ANS), sympathetic as well as parasympathetic. In a previous study, the neural circuitry of the activation of the ANS associated with internet addiction was found to be same as in drug addicts.[11] IA was associated with higher sympathetic activity and lower parasympathetic activity.[12]

But there is very little knowledge about the efficacy of treatment approaches for IA. Therefore, this study was conducted to assess the effect of internet de-addiction programme on the perceived stress and autonomic functions in the younger age group. So our objective was to compare the perceived stress score and frequency domain heart rate variability indices before and after the comprehensive rehabilitative sessions for young adults suffering from problematic internet addiction

Material & Methods

Study setting: The present study was an interventional longitudinal study, carried out in the Department of Physiology and Department of Physical Medicine and Rehabilitation, at Dr. Ram Manohar Lohia institute of Medical Sciences, Lucknow, Uttar Pradesh, India; a tertiary care teaching hospital in urban setting.

Study design:
The data collection was after getting appropriate permission from the institutional ethics committee (IEC No. 86/20) and the total study duration will be of 2 months. Young adults of age group 18-35 years who are frequently using smart phones and gadgets were included in the study. 30 moderate to severely addict to internet and gadget related activities were randomly selected as study sample.

Intervention:
Comprehensive internet de-addiction programme based on repeated sessions of psychological counselling and behavioral therapy as per advised by an expert clinical Psychologist, posted in the Department of Physical Medicine and Rehabilitation.

Psychological Treatment for Internet Addicted Individuals
Two approaches were used as part of psychological treatment to treat individual's smart phone addiction. First approach was behavioural treatment and other was self-help treatment approach.

A. In the behavioural treatment, cognitive behavioural approach (CBT) is a classical approach for changing addictive thoughts and behaviours. CBT help patients to overcome addiction by helping to dismiss false beliefs and insecurities that lead to addiction by providing self-help tools to better their moods, teaching effective communication skills. Many smart phones addicted individual feels "Triggers" — cues leading to increased internet use throughout the day. CBT helps in dealing with these triggers in three ways: (i) Recognize- Identification

of circumstances that leads to smart phone addiction. (ii) Avoid- Remove oneself from trigger situations in appropriate manner. (iii) Cope- Use CBT techniques to address and alleviate emotions and thoughts that lead to the addiction.
The treatment was given for total 6 sessions, each session of 30 minutes duration, every week.

B.The second approach, the Self-Treatment for internet addiction could treat both physical symptoms at first and then mental problems. This approach was a group activity introduced after initial assessment. In this approach all individuals in a group were trained to follow preventive measures to avoid smartphones. One method was: Setting of time limits for not using mobile (for e.g. Two hours in the morning and evening both, designate activities in which your phone is forbidden (e.g., driving, dinner time), schedule break times to access phone, removal of excess apps, not to use smart phones in the bedroom/bathrooms as much as possible, training of relaxation techniques such as mindfulness (4 minutes deep breathing exercise) to cope with cravings to use smartphones, download an application to help cut down on smart phone use and trace the amount of time individual is spending on smartphone and that applications.

Data Collection procedure and instruments used:
Every participant was studied twice, once before the de-addiction programme and again six weeks after the comprehensive internet de-addiction programme.
Baseline and follow up recordings of Resting Heart rate, Resting Blood pressure, Perceived stress scale; Autonomic functions based on frequency domain heart rate variability (HRV) were done.

A. Resting Heart rate (HR):

One-minute continuous recording of Electrocardiography (ECG) after adequate rest in quiet surroundings.

B. Resting Blood pressure (BP):

Recording of Systolic and diastolic BP with the help of Digital sphygmomanometer (working on the principle of oscillatory method), were done after adequate rest in quiet surroundings.

C. Perceived Stress scale:

Analysis of the subjective estimate of perceived stress with the help of a questionnaire-based scale. The Perceived Stress Scale (PSS) is a classic stress assessment instrument.[15,16] The tool, while originally developed in 1983, remains a popular choice for helping us understand how different situations affect a person's feelings and their perceived stress. The questions in this scale ask about their feelings and thoughts during the last month. In each case, they were asked to indicate how often they felt or thought a certain way. Although some of the questions are similar, there are differences between them and they should treat each one as a separate question. The participant was asked to answer fairly quickly. That is, they would not try to count up the number of times they felt a particular way; rather indicate the alternative that seems like a reasonable estimate.

D. Heart Rate Variability (HRV) (4-channel polygraph, AD instruments):

Heart rate variability based on frequency-domain analysis were assessed:

Frequency domain HRV: The Spectral analysis expresses heart rate as a function of frequency, not as a function of time). It concentrates on revealing the cyclical nature hidden in the series of changing RR intervals. The frequency and magnitude of these oscillations are measured, which allows the calculation of the power density for separate frequency ranges. The following components were assessed: (i) LF (component of the low-frequency range, 0.04-0.15 Hz, modulated by both the sympathetic and parasympathetic nervous system and also associated with baroreceptor activity), (ii) HF (component of the high-frequency range, 0.15-0.4 Hz, modulated by the parasympathetic nervous system, connected with respiration and blood pressure changes), and (iii) LF/HF ratio, reflecting interactions of both types of autonomic modulation, (iv) Total power HRV reflects overall autonomic activity.
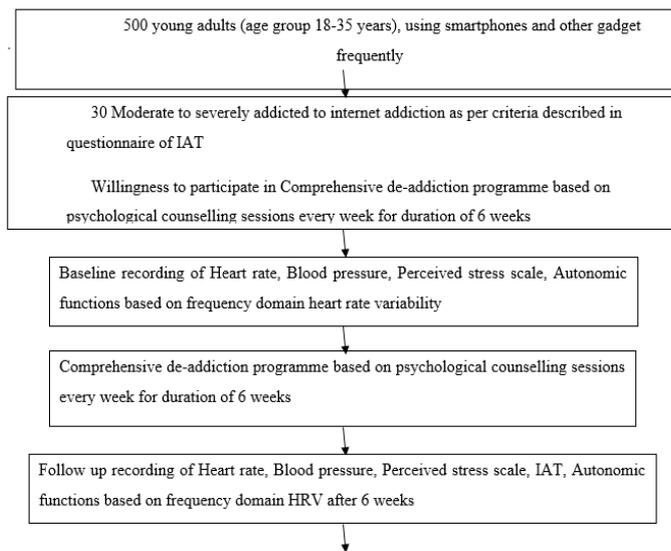

Figure1: Consortium showing research protocol, data collection and analysis.

Quality control:

Both times of recordings of all parameters at the baseline and during follow up recordings were done by Principal Investigator after obtaining thorough training of investigation procedures. The internet de-addiction programme was completed by an expert clinical psychologist.

Confidentiality:

Anonymity and confidentiality of the participants were maintained at all levels.

Ethical consideration:

As this study involved human participants, approval from Institutional ethics committee were received before start of study. The informed written consent from all the study participants was obtained before their enrolment. There was no any serious health events to the participants involved in this study, still all participants were given utmost dignity and due care for their best interest.

Data analysis/ statistical tools:

The quantitative data of results of HR, BP and HRV obtained were tabulated in the form with the help of Microsoft excel workbook and were expressed as mean ± Standard deviation. The qualitative data of perceived stress and Internet addiction were made in the form of appropriate scores. Average daily smartphone usage time was also noted. Comparison of baseline and follow up data were done by using Paired T test. P value of less than 0.05 was indicative of statistical significance for comparisons.

Observations and Results:

Among 500 young adults 30 moderate to severely addicted cases were evaluated. Mean age was 23.67 ± 4.75 years and mean weight was 63.72 ± 9.91 kg (Table 1). At baseline, on initial assessment average daily mobile usage time was 485.08 ± 80.54 minutes that was progressively reduced to 260.74 ± 32.36 minutes among comprehensive internet de-addiction programme (Table 2 and Figure 1). Table 2 shows that there was significant decrease in average daily mobile usage time after 6 weeks of follow up.

Table 1: Descriptive statistics of study participants

Gender	Male: N= 17; Female: N= 14
Age (in Years) (mean ± SD)	23.67 ± 4.75
Height (in cm) (mean ± SD)	169.40 ± 11.03
Weight (in Kg) (mean ± SD)	63.72 ± 9.91
Body mass index (mean ± SD)	22.84 ± 2.01

Table 2: Average daily mobile usage time at base line and at weekly intervals during comprehensive internet de-addiction programme

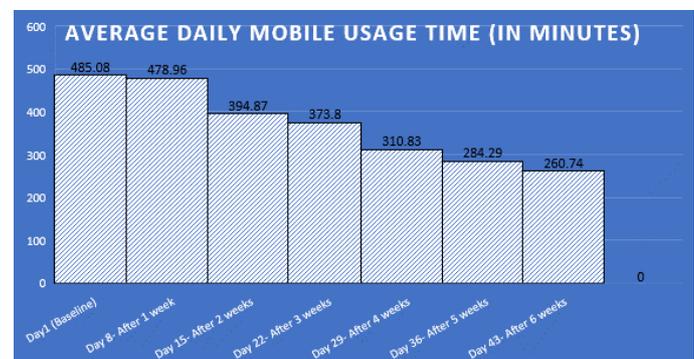| Assessment days	Average daily mobile usage time (in minutes)
Day 1- Initial assessment (Baseline)	485.08 ± 80.54
Day 8- After 1 week	478.96 ± 66.39
Day 15- After 2 week	394.87 ± 71.10
Day 22- After 3 week	373.80 ± 51.47
Day 29- After 4 week	310.83 ± 44.75
Day 36- After 5 week	284.29 ± 28.52
Day 43- After 6 week	260.74 ± 32.36
Paired T test (Baseline Vs After 6 week) (p value)	0.000003094

Figure 1: Average daily mobile usage time at base line and at weekly intervals during comprehensive internet de-addiction programme

Comparison of Perceived stress score and Internet addiction scores of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme showed that there was significant decrease in Perceived stress score (p value 0.03082) and Internet addiction scores (p value <0.0000001) after 6 weeks of follow up (Table 3 and figure 2).

Table 3: Comparison of Perceived stress score and Internet addiction scores of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme

Parameters	Baseline (N=31) Mean ± SD	Follow-up (N=31) Mean ± SD	Paired T test (p value)
Perceived stress score (PSS)	20.64 ± 5.33	17.74 ± 4.99	0.03082
Internet Addiction Test (IAT) score	64.51 ± 16.94	37.77 ± 13.93	<0.0000001

In another comparison of Heart rate and Blood pressure of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme, no significant differences in cardiovascular parameters at baseline and follow-up were found (Table 4).
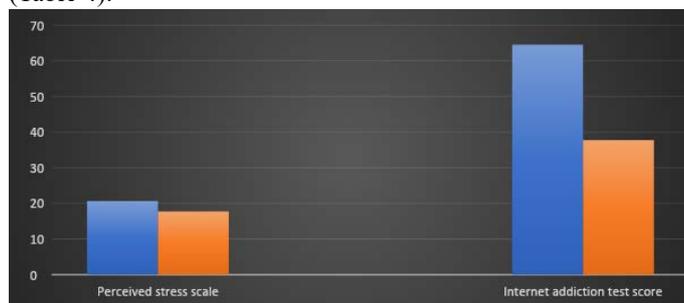

Figure 2: Comparison of Perceived stress score and Internet addiction scores of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme

In the study, on comparison of Heart rate variability parameters of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme, it was found that there was a significant increase in total power of HRV (p value 0.04759) whereas significant reduction in LF/HF ratio (p value 0.01410) after 6 weeks of follow up. However, other frequency domain HRV parameters did not changed significantly (Table 5).

Table 4: Comparison of Heart rate and Blood pressure of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme

Cardiovascular Parameters	Baseline (N=31) Mean ± SD	Follow-up (N=31) Mean ± SD	Paired T test (p value)
Heart rate	76.96 ± 10.02	76.09 ± 9.65	0.7289
Systolic Blood Pressure	116.06 ± 11.05	117.16 ± 6.86	0.6394
Diastolic Blood Pressure	73.61 ± 7.14	75.09 ± 5.13	0.3524

Table 5: Comparison of Heart rate variability parameters of participants at baseline and after 6 weeks of comprehensive internet de-addiction programme

HRV Parameters	Baseline (N=31) Mean ± SD	Follow-up (N=31) Mean ± SD	Paired T test (p value)
Total Power	3243.34 ± 514.31	3560.038 ± 703.98	0.04759
VLF %	34.544 ± 17.23	30.91 ± 14.64	0.8765
LF%	29.72 ± 12.23	31.27 ± 14.33	0.4718
HF %	33.43 ± 15.22	35.72 ± 16.62	0.5737
LF/HF	1.37 ± 0.43	1.16 ± 0.17	0.01410

Discussion

500 young adults (age group 18-35 years), using smartphones and other gadget frequently were asked to answer Kimberley Young's Internet addiction test (IAT) questionnaire.[13] As per their responses 31 moderates to severely addicted to internet addiction (IAT score 64.51 ± 16.94) were motivated to participate in a comprehensive internet de-addiction programme, based on repeated sessions of psychological counselling and behavioral therapy as advised by an expert clinical Psychologist. Baseline and follow up (after 6 weeks) recording of Heart rate, Blood pressure, Perceived stress scale, IAT, Autonomic functions based on frequency domain HRV were done. There was significant increase in total power of HRV whereas significant reduction in LF/HF ratio, Perceived stress scores (PSS), Internet addiction scores and average daily mobile usage time after 6 weeks of follow up.

The significant decrease in Internet addiction scores and average daily mobile usage time in our study were in accordance with the study carried out by Young Kimberly . In this study cognitive-behavioral techniques for internet addiction were applied, and their results suggested that participants were able to decrease thoughts and behaviors associated with compulsive internet use. Thus this study is useful in treatment planning with evidenced-based protocols unique to this emergent client population.[13,14] The significant decrease in stress scores following psychotherapy sessions were also similar to previous studies. Ugwuanyi, Christian S. et al in a randomized controlled trial involving 12-week cognitive behavior therapy intervention, led to a significant decrease in the occupational stress among participants.[17] Farideh Golshani et. al in their controlled randomized clinical trial aimed to determine the effect of group cognitive behavioral therapy (CBT)-based counseling on perceived stress, anxiety, depression, and quality of life (QoL) of pregnant women with a history of primary infertility. They also concluded that CBT counseling can affect the perceived stress, anxiety, and quality of life18. Our results regarding stress levels were also similar to those found in other studies (Erickson et al., 2007; Navarrete-Navarrete et al., 2010),

where stress control programs lead to improvements in their selected variables.[19, 20]

In our study another significant finding was increase in total power of HRV and reduction in LF/HF ratio. This shows the de-addiction program also helped the participants in improving overall autonomic balance and significantly reduced sympathetic reactivity. In a recent study published by Aelee Jang, it was found that CBT based psychotherapy sessions leads to significant changes in HRV parameters particularly reduction in LF/HF ratio. In the same study it was also found that the changes in the LF/HF ratio were also significantly and positively associated with changes in GI symptoms, stress and related conditions.[21] This type of correlation between heart rate variability and stress, and related psychosomatic symptoms are important tool for assessing the efficacy of psychotherapy tools. In a study done by Rod K. Dishman et al. (2000), there was an inverse relationship between perceived emotional stress during the past week and the normalized HF component of HRV. That indicates a lower cardiac vagal component of HRV andthus imbalanced sympathovagal tone among participants who perceived more stress.[22] Regarding no any significant changes in cardiovascular parameters even despite significant changes in autonomic balance and reduction in sympathetic activity, this can be explained by the fact that the during initial enrolment all participants were normotensive and there heart rates and ECG were also normal, even prehypertensive persons were excluded. The autonomic changes either by exercise training, yoga or any other form of psychotherapy, generally takes some weeks to months to be reflected in the form of cardiovascular changes (Bernhard Grässler et al 2021; Aaron I. Vinik et al 2003, Jasrotia R.B. 2019).[23-25] In an another study by Redeker NS (2018) aimed to find the effects of CBT for Insomnia on Sleep, Symptoms, Stress, and Autonomic Function Among Patients With Heart Failure, CBT has been found to be an effective tool.[26] Thus, this study findings are in accordance of many similar studies.

Limitations: First of all, in order to avoid the influence of other irrelevant factors, a larger sample size in study may be needed to more directly and clearly measure the level of stress and internet addiction. As both these important scales were based on self-reported questionnaire basis, there were always the chances of bias. This study used a longitudinal design to measure the different parameters and for evaluation of the efficacy of internet de-addiction programme, however because of very small duration of time (only 6 weeks) for counselling sessions, this study being a time-bound study to be completed in very duration of time, cause-effects relationship found in this study can't find significance for long-term effect and for larger population. However, findings in this study could prove as an important reference point as a pilot project for future studies using similar tools for another group of participants. Excess use of internet leading to functional impairment may be co-morbid with pre-existing psychiatric conditions in our findings could be the tip of the iceberg, so a scale to rule out preexisting mental illness could also have been used. Another important limitation of the study could be the possible psychiatric disorders in participants who have not been taking medications has not been ruled out. Understanding of long-term effects and chances of relapse needs to studied in larger number of study participants and also involvement of booster-sessions of CBT, initially on monthly intervals and then at larger intervals, which was beyond the scope of objectives of this study.

Conclusion

This study aimed to evaluate the efficacy of internet de-addiction programme on stress and autonomic functions in young adults. After six weeks of comprehensive sessions based on cognitive behaviour therapy and guiding for self-help approach there were significant decrease in the total daily mobile usages time, internet addiction score, perceived stress score and also simultaneous improvement in symptho-vagal tone and overall autonomic health of participants. This research has positive significance for expanding the study of the relationship between perceived stress and Internet addiction and prescribing timely and effective intervention for the young adults, before any serious psychological issues arose in future.

Suggestions/Justifications:
- Internet addiction is often an unrecognized disorder that impacts a person's ability to control the compulsiveness for online use. This sometimes happens to an extent that it causes mental and physical problems along with relation-discord, occupational, and many other social problems.
- Cognitive behavioural therapy combined with self-help approach is an important method for the management for Internet addiction, and addiction recovery in general.
- As this problem is very much prevalent in young adults, the mass awareness programme highlighting about the problems associated with excessive internet usage and prolonged screen time should be initiated at different platforms.
- Parents should be also made aware of this problem creeping very fast in adolescents and young adults; they should be provided easy approaches for solution.

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