

Physiological Effects of Prolonged Internet Use on Heart Health Effect, Sleep Patterns, Appetite, and Musculoskeletal Health

Saly Naser Abbas

Department of Biology, College of Education for pure Science, University of Kerbala, Kerbala, Iraq

Email: sally.n@uokerbala.edu.iq (Corresponding author)



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Abstract

Introduction: The paper examined the effects of the extended use of the internet on cardiovascular symptoms, sleeping habits, appetite, and musculoskeletal wellbeing. The survey was a cross-sectional survey of 185 adult subjects, which measured daily screen time and pre-sleep exposure, sleep quality, physical complaints, changes in appetite, and cognitive symptoms. The results showed that widespread long-term internet usage, exposure to it just before going to bed, insomnia, low sleep quality, and morning fatigue were common. The complaints that were regularly mentioned were fatigue, palpitations, appetite disregulation, neck, shoulder, and back pain. Additionally, there was a great effect on the heart rate of the participants, and many of them claimed that their resting heart rate was high and they experienced tachycardia occasionally, which was likely due to the enhanced sympathetic activity. To conclude, the idea of chronic internet use appears to be a major behavioral stress factor in need of the implementation of healthier digital habits and additional longitudinal research.

Methods: Our research design was A cross-sectional quantitative survey, which entailed 185 adult internet users to investigate the effects of a long-term internet use on physiological and behavioral consequences. The respondents completed a questionnaire, which contained questions on their daily internet use, exposure to screens before sleep, cardiovascular responses to online actions, sleeping disturbances, appetite alterations, musculoskeletal symptoms, and cognitive symptoms, including eyestrain and loss of concentration. The analysis of the data was performed by the descriptive statistics that covered frequencies and percentages and were presented in the tables and in Figure. The method helped to determine the common trends of internet use over a long period of time and its association with autonomic, musculoskeletal and neurocognitive outcomes.

Results: The findings part includes the distribution of the responses of the participants in the case of daily internet. Use, sleep patterns, behaviors about the appetite, and musculoskeletal symptoms. Findings are recorded in frequencies and percentages and presented in the form of graphical figures.

Conclusion According to this study, there are physiological, behavioral, and cognitive effects of the effects of long internet use. Excessive use can disrupt sleep causing difficulty in falling asleep, staying asleep, morning drowsiness and circadian rhythm disturbance. The alterations in eating habits might cause metabolism problems, whereas cognitive and neurological stress would cause headaches, stress, and overload especially during disconnections or interruptions. The effects vary depending on personal usage patterns, lifestyle and physiological strength. These findings represent the relevance of both deliberate and moderate internet use in duration and timing. Additional longitudinal studies are encouraged in order to study causal correlations and preventive measures.

Keywords: Appetite Changes, Digital Stress, Musculoskeletal Symptoms, Prolonged Internet Use, Sleep Disturbances.



1-Introduction

The rapid development of the internet and other digital technologies has changed the modern life and made the online connectivity an important resource in education, communication, work and entertainment. The use of portable devices and smartphones in the recent past has brought about a lot of screen time making most people to spend hours of unproductive time and continuous digital multitasking. (Twenge & Campbell, 2018). identify five stages of generational change: nature versus nurture, high school versus college, marriage versus family, church versus religion, and career versus self. World Health Organization. (2019). Despite the unique social and economic advantages of the internet, widespread and prolonged use of the internet has been linked with a growing number of health-related problems. The focus of current research has mainly been on the psychological and behavioral effects of overuse of the internet. (Montag & Elhai, 2020). Although much less attention has been paid to the physical and physiological consequences, which include cardiovascular load, sleep-wakeing disturbances, disrupted appetite, and musculoskeletal pain. Certain ones (Exelmans & Van den Bulck, 2016 (4); Carter *et al.*, 2016 (5); Chaput *et al.*, 2017 . show that it is not the only one among the primary factors.<|human|>Some of them ((Exelmans & Van den Bulck, 2016; Carter *et al.*, 2016); Chaput *et al.*, 2017 . demonstrate that it is not the single one of the principal factors. Moreover, recent studies show that screens can have some influence on the regulation of heart rate and autonomic balance, particularly in the evening time, when exposure to screens is prolonged.

Even with the growing amount of research, there has been a major gap: most of them study these physiological outcomes independently of each other as opposed to studying them as interrelated processes. This piecemeal approach severely hinders our understanding of how cardiovascular responses, insomnia, hunger changes, and musculoskeletal problems could occur in combination as part of an organic physiological system. Very few studies adopted an approach that incorporated heart rate, patterns of sleep-wake rhythms, feeding behaviors, and musculoskeletal state outcomes in a single group of subjects. A key symptom of computer work that contemporary people and their children share alike is time spent glued to a screen, which means the body has been under various abnormal stresses for increasingly long periods now. (McEwen & Akil, 2020) .

The goal of the study will be to capture in formulaic terms what, eventually, the physiological and biochemical effects of long-term Internet use might be. This is to say in human terms what the consequences are to our physical selves. The impact this has on our senses of touch: Is there something we give up for not feeling anything as we move across a scene? How our ear and vision respond when under exposure conditions which are normal but greatly different from those, we have evolved with for millions of years. With the aid of an analytical approach based on the framework, the research is expected to offer a comprehensive portrait of one these systems interact thus become digital exposure over for long periods and thus to add to the broader digital health literature. Also, it will contribute a future of public health and behavioral interventions.

2. Methodology

2.1 Study Design

Therefore, a quantitative cross-sectional investigation method was employed to discover what physiological activity connected to frequent use of the Internet. It gathered self-reported well-being health-related data and internet engagement regular habits from a specific population at one moment in time.

2.2 Participants and Data Collection

185 respondents completed the online Questionnaire. A nonprobability sample that mirrored the general public in demographic terms and had a daily internet use Participants were given a full explanation of the aim of study before participating in it and all gave their Consent. Participation was

nothing more than voluntary and confidential; no personal identifying information was obtained from you.

2.3 Research Instrument

- in the form of a structured questionnaire was designed and developed for this research instrument. Prepared by researchers themselves, it reflects their goals and objectives as presented below Physical Health and Lifestyle Self-Rated Health and Lifestyle
- How often do you go online each day? What do top activities on the Internet have in common? And apart from things that were fun and enjoyable up until today, finally what's your biggest priority tomorrow night
- Sleep habits (regular or irregular) and sleeping quality
- What kinds of factors directly contribute to dangerous weight loss plans
- Pain in the waist or back, etc
- Solving a few noumen Chemical and real observation approach
- All items followed the same arrangement, consistent with those typically used for quantitative analysis. Regardless of content, quality cannot be evaluated easily when some parts come first while others come last based on what is better understood (by themselves or others).

2.3.1 Validity and Reliability

The subject matter experts in digital health and behavioral sciences evaluated the content validity of the questionnaire. Their evaluation was based on the clarity of items, whether they were appropriate, and their consistency with the study goals. Reliability was assessed in a pilot test and internal consistency through Cranach's alpha. All the elements in the major domains can be seen to be reliable. This indicates that the scale items pretty much consistently measured what they were supposed to measure.

2.4 Data Collection Procedure

The survey has been conducted on the Internet, using a secure survey platform. Responses were automatically collected into the database for protection. Only completed questionnaires of which all questions have been filled out completely made it into the final dataset.

2.5 Statistical Analysis

Data were coded and analyzed using statistical software. The codes were predefined for each variable. SPSS, specific software and variables were not defined. Descriptive statistics, including frequencies and percentages, were used to summarize participant responses. Visual representations such as tables, bar graphs, and pie charts were employed to facilitate clear presentation of distribution patterns.

2.5.1 The results are characterized as descriptive rather than causal.

Based on a cross-sectional design and the dependence on self-reported data, its outcomes are descriptive in nature rather than indicative of causation. The findings show correlations and trends among the variables, but none of them can confirm cause-and-effect relations between internet use physiological results.

2.6 Ethical Considerations

In this study, established ethical standards for human research were followed. Participation was voluntary, all subjects gave their informed consent. And to ensure privacy, no personally identifiable information was requested of anyone involved in the survey's data collection process. The

research followed established ethical standards for human research. Participation was voluntary, all subjects gave their informed consent, and confidentiality was strictly preserved. No personally identifiable information was collected.

3. Results

The distribution of participants' responses on internet usage per day, musculoskeletal problems and other symptoms, their sleep habits and appetite-related behaviors can all be seen in the results section. These findings have been presented as both frequency figures (denoted by F.) and percentages and graphically depicted by means of figures.

To help us understand the relationship between daily internet usage and symptoms reported, we also carried out a descriptive statistical association on symptoms including fatigue and muscular discomfort classified by different internet usage durations (8 hours). The analysis clearly illustrates a positive trend that's different: as daily internet usage. I get a free coffee with breakfast. The association of physiological and behavioral complaints with daily usage hours showed a distinct positive trend. As internet use increased, so too did the prevalence and intensity of symptoms in these areas.

Those people who utilized the internet in excess of 7-8 hours each day invariably stood out occupationally speaking--they always got the highest scores on fatigue, musculoskeletal distress, late night hunger pangs and lack of concentration. For example, the incidence of post-use fatigue increased from 52% in participants using the internet for 2 to 4 hours, to over 80% for those who used it 8 plus hours a day. Similarly, the occurrence of neck or back pain was highest among internet users in 5 to 7 hours category, rolling right along into those who utilized the Internet for more than 8 hours each day.

Appetite-related troubles exhibited a similar pattern: late-night hunger niggles and the manner in which people looked forward to eating something were both substantially more prevalent among persons who indulged themselves with an extended period of online activities (and hence one might assume lack of demand for food), possibly because the long-term stimuli from these operations upset their original hunger-satiety signals.

The results obtained from this investigation show an association between increased daily internet usage and increases in the number of health complaints in four areas: musculoskeletal, appetite, cardiovascular and mental health. However, since it is a cross-sectional study, we cannot infer from this relationship that more daily use leads to worse symptoms. So many aspects of personal lifestyle such as one's base of health all may cause differences whilst coping strategies also play an influence on the result.

The findings indicate a statistical link between increased daily internet usage and increased symptoms in different health domains, such as musculoskeletal, appetite-related responses as well as those concerning cardiovascular and cognitive aspiration. However as this is a cross-sectional survey, we can only describe the correlation. Therefore, differences in individual living styles may affect what we see and not just by comparing frequency bars on charts--verses taken from an inspirational missal

3.1 Internet Use Patterns

Daily Internet Use Duration

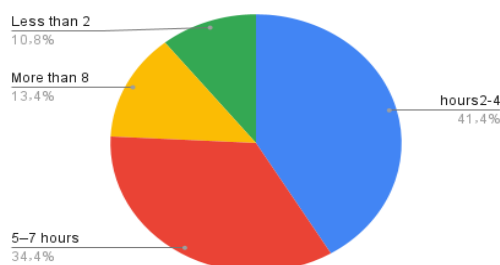


Figure 1. Distribution of participants' daily internet use duration

Figure 1: illustrates the distribution of participants' daily internet use duration. The largest proportion of participants reported using the internet for 2–4 hours per day (41.4%), followed by 5–7 hours (34.4%). Smaller proportions reported usage exceeding 8 hours (13.4%) or less than 2 hours per day (10.8%).

Pre-sleep Internet Use

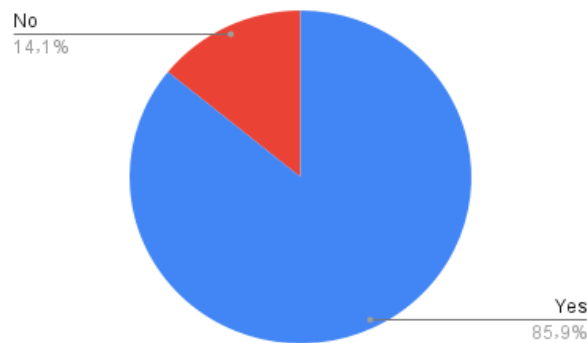


Figure 2. Computer use for the Internet 30 minutes before sleep

Figure 2: Internet use before bed by participants. Most of the participants used the internet in the last 30 minutes before sleeping (85.9%), while a smaller number did not use this source in that time frame (14.1%).

3.2 Physiological Indicators

3.2.1 Heart Palpitations During or After Prolonged Internet Use

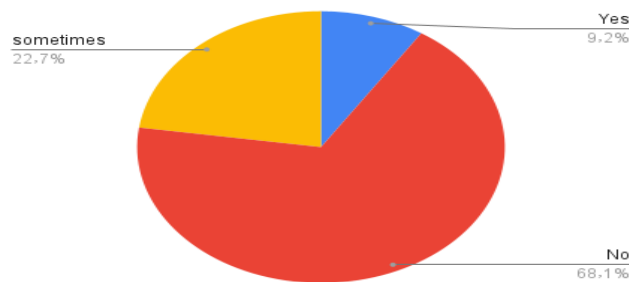


Figure 3. The heart palpitations of the participants in the course of or after extensive internet use.

Figure 3: is the participants' response of having heart palpitations during or after prolonged use of the Internet. Most respondents had not experienced heart palpitations (67.7%), and 22.6% reported ever having them on occasion. A minority of participants also experienced frequent heart palpitations (9.7%) while or after prolonged internet surfing.

3.2.2 Cold Extremities During Screen Use

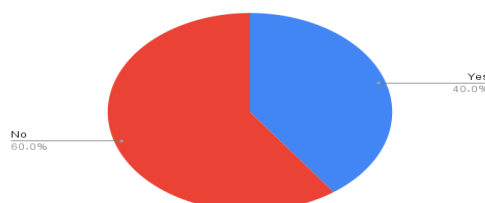


Figure 4. Distribution of individuals who experience cold extremities when in use of the screens.

Figure 4: the distribution of responses to cold sensations in the extremities when using the screen is presented in Figure 4. Cold hands/feet Sensation of cold hands or feet while DHIs were used was reported by 40% and not at all by another 60%.

3.2.3 Increased Heart Rate During Prolonged Internet Use

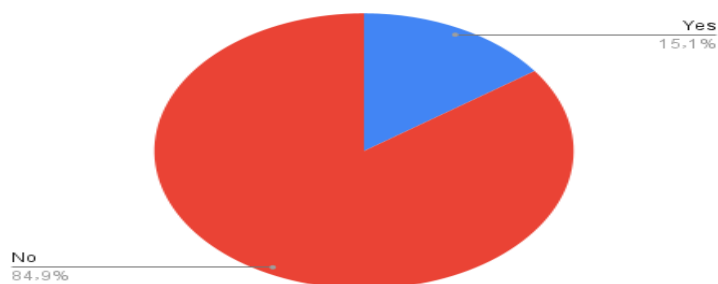


Figure 5. Participants Distribution of those that have an Increased Heart rate with Prolonged Internet Use.

Figure 5: Perceptions of increased heart rate While participants were engaged in prolonged use of the internet, perceptions are displayed in Figure 5. Out of them, the majority (84.9%) did not experience an increase in heart rate, and 15.1% took note of a higher heart frequency when they used the internet over a long period.

3.2.4 Fatigue or Lethargy After Long Internet Sessions

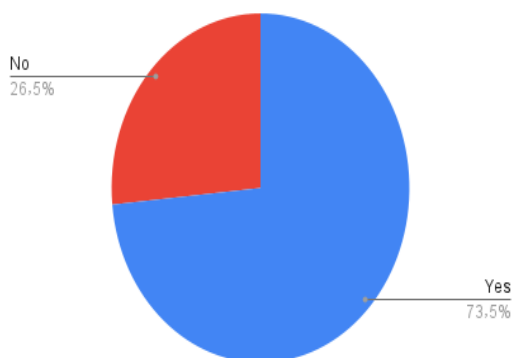


Figure 6. Distribution of Participants Reporting Fatigue or Lethargy in the Aftermath of Long Internet Use.

Figure 6: response distribution regarding fatigue or tiredness after long internet sessions are shown in Figure. A large proportion of participants (73.5%) experienced some degree of fatigue and lethargy after prolonged use, while 26.5% did not experience this symptom.

3.3 Appetite and Weight

3.3.1 Increased Appetite During Internet Use

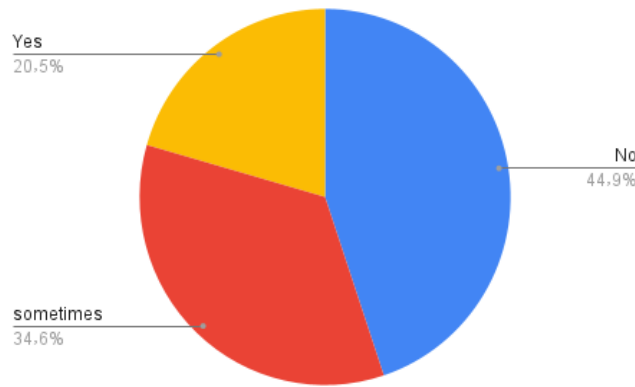


Figure 7. Participant Distribution Perceiving Increased Appetite When on the Internet.

Figure 7: results Participants' responses to increased appetite connecting with using the internet is shown in Figure 7. The appetite of some participants did not change at all (44.9%), for others, the increase in food craving occurred sometimes (34.6%). A lower percentage reported inducible increase in appetite (20.5%) during computer use.

3.3.2 Snacking During Internet Use

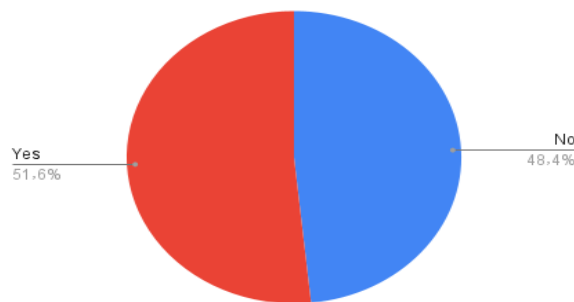


Figure 8. People who watch Snacks on the Internet.

Figure 8: the distribution of responses by participants pertaining to snacking during internet use. Just over half of the subjects stated that they snack whilst using the internet (51.6%) while 48.4% do not.

3.3.3 Late-night Hunger During Phone Use

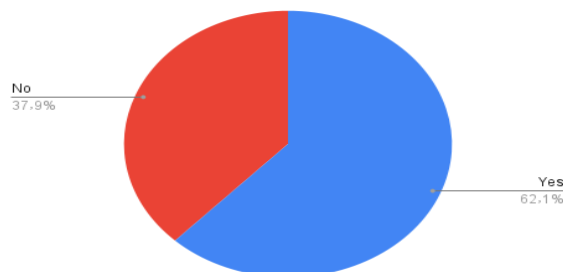


Figure 9. People Faced with Hunger and their mobile phones at night.

Figure 9: presents experiencing's of late-night hunger during phone use in participants. Most participants felt hungry (62.1%) during late-night phone use, except for 37.9% who did not feel hungry.

3.3.4 Weight Change Over the Last Six Months

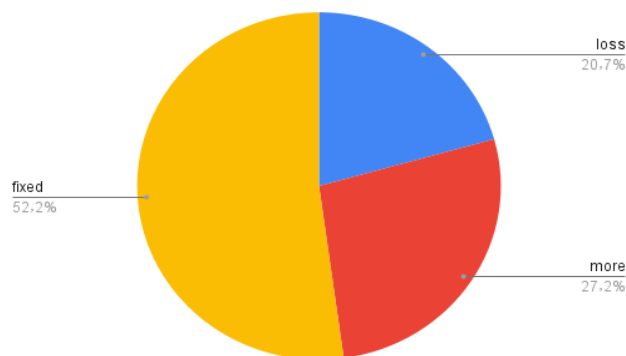


Figure 10. Changes in the weight of the participants during the previous six months.

Figure 10 shows the self-reported weight change for the past six months of each participant. More than half of the subjects responded that they had maintained body weight (52.2%), about 27.2% responded that their body-weight had increased, and 20.7% reported a decrease in weight. A lower percentage of individuals reported losing weight (20.7%) over the same interval.

3.4 Musculoskeletal Symptoms

3.4.1 Neck and Shoulder Pain After Device Use

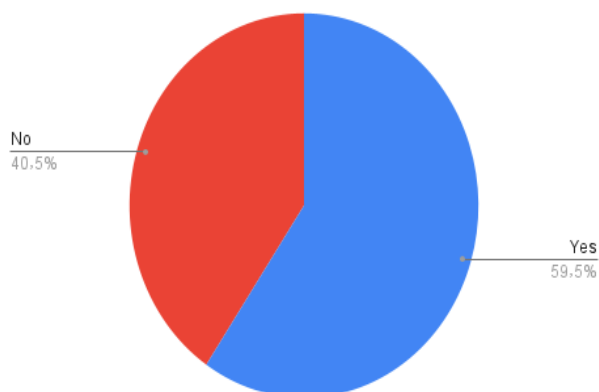


Figure 11. participants with Neck and Shoulder Pain After using the device.

Figure 11 shows the examiners' reports of neck and shoulder pain following device usage. Most of the subjects (58.9%) had neck or shoulder pain after device use, while 41.1% did not report any neck or shoulder pain.

3.4.2 Back Pain During Prolonged Internet Use

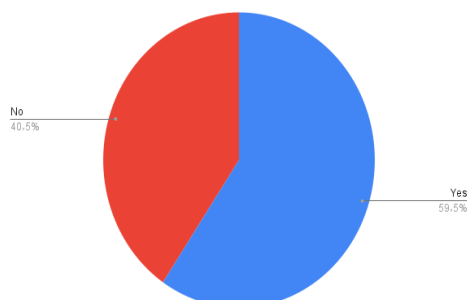


Figure 12. participants with Back Pain as the result of the long use of Internet.

Figure 12 shows participants' reports of back pain during prolonged internet use. 59.5% of participants reported experiencing back pain during extended internet use, while 40.5% reported no back pain.

3.4.3 Numbness or Tingling in Hands or Fingers

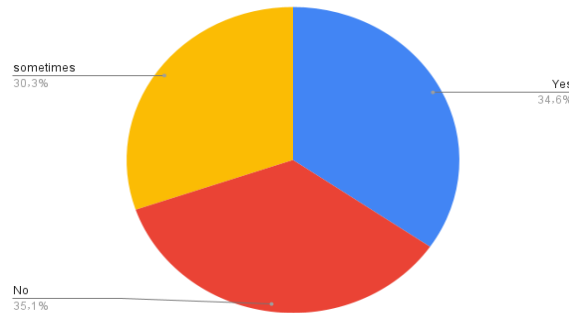


Figure 13. Individuals Experiencing Numbness or Tingling in Their Hands or Fingers

Figure 13: It can be seen from Figure 13 that participants experienced numbness or tingling in the hands or fingers. Numbness was reported by 34.6% of the sample, occasional numbness by 30.3%, and no numbness or tingling symptoms by 35.1%.

3.5 Cognitive / Neuro Indicators

3.5.1 Difficulty Concentrating During or After Internet Use

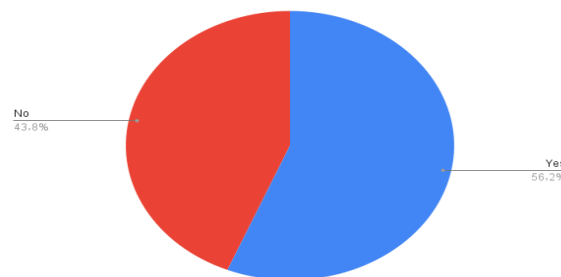


Figure 14. Individuals Facing Challenges in Maintaining Focus While Using the Internet or Subsequently

Figure 14: Participants' responses on the difficulty to concentrate during or after internet use. More than half of the students (56.2%) indicated that they had a problem to concentrate, while 43.8% did not.

3.5.2 Eye Strain After Screen Use

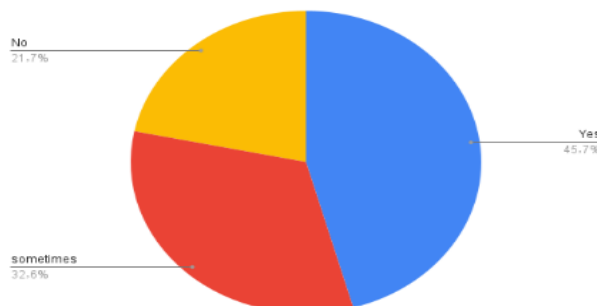


Figure 15. Individuals Suffering from Eye Strain Following Screen Usage

Figure 15: illustrates participants' impression with eyestrain after using a screen. At least 45.9% of participants complained of frequent eye strain and 32.4% occasionally experienced eye strain. A smaller number of volunteers (21.6%) reported not to perceive eye strain after use of the screen.

3.5.3 Headache After Screen Use

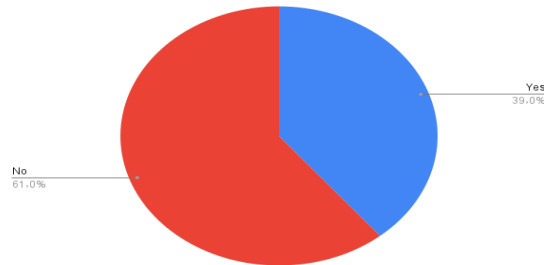


Figure 16. Individuals Suffering from Headaches Following Screen Usage

Figure 16: shows participants' reports of headaches after screen use. A majority of participants reported not experiencing headaches (61.0%), whereas 39.0% indicated experiencing headaches following screen use.

3.5.4 Stress or Anxiety During Internet Disruption

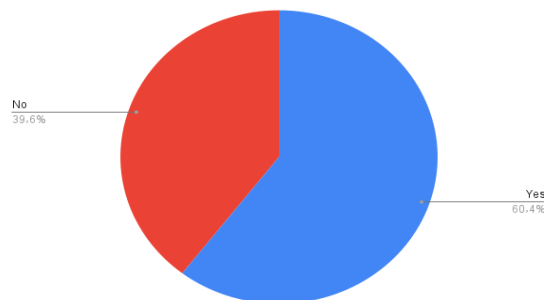


Figure 17. Individuals Facing Stress or Anxiety Amid Internet Outages

Figure 17: illustrates participants' responses regarding stress or anxiety during internet disruption. Most participants reported experiencing stress or anxiety when internet access was disrupted (60.4%), while 39.6% reported no such emotional response.

3.5.5 Feeling Tired Immediately After Waking Up

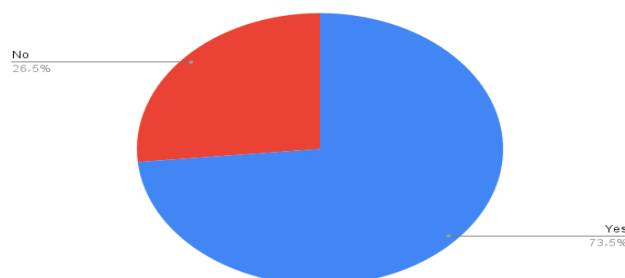


Figure 18. Participants Feeling Tired Immediately After Waking Up

Figure 18 illustrates participants' responses regarding feelings of fatigue immediately after waking up. A substantial proportion of participants reported feeling tired upon awakening (73.5%), whereas 26.5% reported not experiencing fatigue immediately after waking.

4. Discussion

In the present cross-sectional study, the objective was to examine the effects of extended internet use on what its participants did after bedtime and their ability to think in response to new information or questions as well as desire for food after eating. These findings together indicate that prolonged habitual use of the Internet had a series physiological and behavioral disturbances, supporting our view that this form digital overexposure is potential multidimensional biological stressors.

4.1 Internet as a Physiological Stressor

According to the results, a considerable portion of the respondents suffered physical problems as and after using Internet network for long periods of time; such symptoms included palpitations, rapid pulse rates; cold limbs (the person would wear extra clothing even though there was no need to do so); and final anfter-use weariness of (some 20) minutes can reach an unbearable level. This discovery is consistent with earlier evidence, such as that of autonomic dysfunction and physiological stress induced by over-use of screens ((McEwen & Akil (9), 2020). Montag & Elhai, 2023. Supplemental material However, the relatively high prevalence of typical cardiovascular symptoms such as palpitations and increased heart rates together with fatigue signs supports the view that long-term heavy use of the Internet might indeed be seen as a chronic, low-grade stressor. This is not 'neutral activity. Comparable physiologic trends have been observed in research on digital overuse and stress-related somatic complaints (Kim *et al.*, 2018). Yet, not all subjects presented with these symptoms, supporting interindividual differences in physiological stress responsivity. Variations in baseline health condition, duration of use, position and stress resilience of participants may account for these differences.

4.2 Effects on Sleep Patterns

Sleep-related disorders were one of the most important end points of this study. A significant number of participants reported using the internet, onset insomnia, middle insomnia and fatigue at awakening. Our findings are in accord with existing research showing that nocturnal screen exposure disrupts circadian regulation, principally via blue light–elicited melatonin suppression (Chang *et al.*, 2015; Cajochen *et al.*, 2011). The high prevalence of pre-sleep internet use in the present study is also likely to contribute to later sleep time and poorer sleep quality, which is consistent with the difficulties reported with falling asleep at night and frequent nocturnal awakenings. Additionally, morning tiredness of participants indicates a lack of recuperative sleep, as has been reported in groups of individuals with increased evening screen time (Hale & Guan, 2015) . However, the lack of sleep complaints in some participants implies possible adaptation or compensation as a function of luminal characteristics (for instance reduced screen brightness or shorter exposure) and/or individual differences in circadian sensitivity.

4.3 Appetite Control and Weight Alterations

The results also showed significant changes in appetite characteristics. Commonly reported body-size-descriptive categories for the previous 6 months were increased appetite, late-night hunger and snacking during the internet use. These findings are consistent with the literature that has associated longer screen time with a disrupted regulation of appetite and greater intake of energy-dense snacks (Chaput *et al.*, 2017; Thivel *et al.*, 2018) . It is possible that excessive use of the internet

etiology and contributes to binge eating due to its ability to distract from fullness cues, while late-night use may interfere with hormonal factors regulating appetite (leptin and ghrelin). The differences in the direction of change in body weight indicate that levels of internet use are mitigated by behaviour, food intake and physical activity.

4.4 Cognitive and Neurophysiological Burden

Symptoms such as headache, eye strain, and just about anything else that normally occurs during time offline due to the lack of Internet (1 to 6 hours), were also part of records Discussion of the Findings Some of the results of this study are consonant with prevailing research conclusions, that has proposed human fatigue and attention deficit may come from many parts of digital media continuous interaction demand in order there issued by different aspects (Loh & Kanai, 2016). Since - 90 As a rough attempt to define the scope of this investigation, we may describe the situation facing modern people as being like "wearing shackles of gold". But if we follow trend line wording of survey results, those proud achievement also reduces work force pressure and opens up greater personal liberty for pursuit not just limited by occupation. Who ends this state alien-action when the Internet pragmatics of offbeat life transitions require furtherurgical intervention?" As for "tired eyes," even though it is often heard, in general the computer use symptoms of headaches were recognized well and are frequently reported: visual accommodation strain reduced blink rate and duration length of near work all present (Sheppard & Wolffsohn, 2018). However, when the subjects' ability to go online was taken away so as provoke an emotional reaction--even feelings of terror or wild panic--may bespeak potential addiction tendencies or else an increasing psychological dependence upon digital connectedness. Those newly developed character traits in one respect. In the case of interruptions to internet usage, only a small number of participants experienced cognitive and emotional impacts. Their reactions revealed a variety of digital strategies, intention to use new media and psychological resilience.

4.5 Integrated Interpretation

Thus, there is evidence from these findings that chronic internet use, not just with cognitive functioning but also connected with sleep architecture and the processes related to appetite, disturbs several those typical physiological systems. Thus, these are no doubt mutually reinforcing effects rather than separate entities, with both piling up together as a physiological/ behavioral 'load'. Also of significance is that these inter-individual differences in how people show the effects of OD make clear that they are not uniform among human beings. This illustrates the importance of moderators (types/quantities/durations and times of use, whether a participant lifestylistically practices these habits and participant biological susceptibility).

4.6 Study Limitations

This study has several limitations that must be kept in mind when assessing the results. Since the data was completely reliant on self-reported measures, there may well be recall bias or subjective interpretation of the material with subsequent social desirability effects. Descriptions by the participants of symptoms such as palpitations, fatigue, changes in appetite, and musculoskeletal discomfort reflect personal perceptions that are not supported by any objectively verified clinical data. Direct physiological or biochemical examinations, such as heart-rate monitoring, hormonal analysis, or musculoskeletal diagnostics were not employed. In this way the study avoided using a wide range of variables that could affect results from individual to individual, but it also restricted our ability to understand the biological mechanisms behind symptoms as felt. Since lack of these objective cues restricts one's capability accurately to pinpoint just what (... if anything) is occurring biologically, the symptoms are most likely acknowledged without either explanation or resolution. Also, the cross-sectional design prevents a causal relationship between heavy Internet use and the

physiological outcomes observed. Future research should integrate more objective physiological measures and longitudinal designs if one is to achieve a clearer understanding of effects brought about by prolonged digital contact.

5. Conclusion

Evidence-Based Recommendations: Based on evidence, the study recommends that long-term internet use is associated with a variety of physiological, behavioral and cognitive effects. First, it causes at least three abnormal correlations. The points he had in mind, therefore, were that prolonged excessive use of the internet affects various systems in the body, resulting in the rhythm of qi and pulse (the latter is being regulated by their relative levels). Second, sleep latency and waking tiredness, are all signs that night-time internet is interfering with your circadian rhythms so you can't complete deep sleep recovery. Third, changes in dietary patterns and eating habits from internet use can have lasting metabolic consequences if wrong habits are repeated. The cognitive and neurological demands of daily access to and use of digital technology amount in effect, to constant headache (in terms such as these) because one's brain must sort out any problem that arises itself. While the complaints of insomnia or other mental and neurological symptoms we associate with various types attachment disorders are not themselves miserable experiences deepened by isolation from home via net--narcotics still mark a limit. In this way, cognitive overload is produced by continual reliance on digital equipment. Needless to say, the internet did not spell doom for everyone, and how one's private usage patterns, lifestyle and even their physical constitution may mediate the effects of different types internet use on health. Overall, these results showed common sense and discipline is still needed for people who spend long periods of time on the internet, including limits and when to start. In addition, longitudinal studies based on physiological data would be needed to determine the existence of a causal relationship between the two factors and to establish if any preventive measures can help mitigate negative health effects arising from long-term internet use.

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