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# *Impacts of Short Videos on Attention Function and Academic Performance: Empirical Evidence from Behavior and Neuroscience*

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***Abstract.*** With the rise of short videos platforms, such as TikTok, Instagram and Youtube, short-form videos have become an indispensable part of daily life. Although it has an extremely high transmission efficiency and due to it is entertainment it can provide people with a way to relax, academic community still hold the view that it may has negative impacts on cognitive competence. This essay aims to discuss how the duration of short video usage and addiction tendency influences the attention and cognitive function of university students, including duration allocation and watchfulness, and further analysis the impacts on scholastic attainment. This essay will adapt mixed research methods. Firstly, using questionnaire survey to analyses the correlation between duration of short video usage and academic performances, and then exam the relationship between Prefrontal Theta power and addiction tendency through electroencephalography technology (EEC) and attention net test. The results are that it shows that students who spend more than 3-4 hours watching short videos every day have significantly lower university GPA compared to those with lower usage levels. Besides according to EEG data, the greater the short-video addiction tendency, the lower the Prefrontal Theta power when they faced cognitive conflictions, and self-control ability will reduce. Overall, prolonged consumption of short videos can lead to "chronic dopamine depletion" and fragmented attention, thereby damaging the brain's executive control network. This neurological damage directly translates into poor academic performance.

***Keywords:*** Short Video Addiction, Attention span, Academic Performance, Cognitive Ability, Executive Control

## 1. Introduction

The prevalence of short-form video platforms such as TikTok, Instagram Reels and YouTube Shorts has reshaped the digital consumption habits of modern society, with student groups emerging as the core audience of such content [1]. Characterized by fragmented presentation, instant sensory stimulation and easy accessibility, short videos have become an indispensable part of daily life for young people, providing a convenient channel for leisure and information acquisition while also

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sparking widespread academic debates on their cognitive and learning impacts [2]. A notable paradox exists in the current research landscape of short video effects: in formal educational contexts, properly designed short instructional videos have been verified to effectively reduce learners' extraneous cognitive load, improve video viewing engagement by 24.7% and boost final exam scores by 9.0% in online-flipped college engineering courses, showing significant pedagogical value [3]. In contrast, unregulated and excessive daily short video consumption has been linked to a series of adverse outcomes for students, including impaired attention span, reduced self-control and declining academic performance.

Existing empirical studies have preliminarily explored the negative correlations between short video usage and learning outcomes: heavy users spending over four hours daily on short videos exhibit a moderate negative correlation (-0.3217) between viewing time and academic scores, accompanied by subjective perceptions of poor concentration and low information retention [4]. Neurophysiological research further reveals that short video addiction tendency is associated with reduced prefrontal theta power under cognitive conflict conditions, which impairs the brain's executive control network and leads to fragmented attention [5]. Despite these findings, current research still has obvious limitations: most studies adopt cross-sectional or short-term observation designs, lacking longitudinal verification of the causal relationship between short video usage and cognitive changes; meanwhile, the differential impacts of educational short videos and recreational short videos on attention function have not been clearly distinguished. Based on behavior and neuroscience perspectives, this study synthesizes empirical evidence from questionnaire surveys, neurophysiological experiments and mixed-methods research to systematically analyze how short video usage duration and addiction tendency affect students' attention allocation, cognitive control and academic performance, and explore the underlying neural and behavioral mechanisms.

This research aims to clarify the dual effects of short videos on cognitive function and learning outcomes, and provide targeted empirical references for guiding students' rational short video consumption and optimizing the educational application of short video media in teaching practice.

## 2. Effects of mobile short video use on attention functions

This is a research study, that is original, published in Frontiers in Human Neurosciencein June 2024, and focuses on examining the neural and cognitive implications of overusing short-form video consumption, which is commonly attributed to such platforms as Tik Tok or Kuaishou. The focal objective was to investigate the thesis of the negative effect of a tendency to addiction to mobile phone short videos on attentional processes and to identify the mechanisms that underlie the effects so far mostly unstudied before this study [6].

The experiment involved a population of 48 healthy adult participants (35 females, 13 males) with the average age of 21.8. The participants were all the users of mobile short-form video applications. The research design involved the use of a multi-faceted research design that incorporated psychological tests, behavioral testing, and neurophysiological recording. The participants were initially subjected to a series of questionnaires, most especially the Mobile Phone Short-Form Video Addiction Tendency Questionnaire (MPSVATQ) to understand their tendency of addiction as well as the Self-Control Scale (SCS). The main experimental methodology was the Attention Network Test (ANT), which is an established paradigm used to measure three separate sub-elements of attention according to the tripartite theory of Petersen and Posner: the alerting network (vigilance), the orienting network (sensory selection), and the executive control network (solving mental conflict and self-regulation). Most importantly, during the ANT, the activity of the participants was recorded with 64-channel electroencephalography (EEG), and a particular

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analytical emphasis was made on the oscillations (4-8 Hz) in the prefrontal cortex, the area of the brain and this frequency that play a critical role in cognitive control [7].

Some important findings were obtained as a result of the analysis, and a significant difference was observed between behavioral and neuroelectric outcomes. At the behavioral tier, the researchers have not identified any statistically significant correlation between the participants in the scores of MPSVATQ (their short video addiction tendency) with the scores on the ANT task (reaction time and accuracy indices of the alerting, orienting, and executive control networks). This implies that at such level of overt task performance in a controlled lab situation, the proposed deficit was not discernibly apparent.

The EEG data however showed a notable and noteworthy neural relationship. The researchers discovered that there was a strong negative correlation between the scores of MPSVATQ and the theta power difference of prefrontal area when there were high levels of executive control. In particular, it was defined in this index as the difference between theta power condition when a resolution of the conflict is needed in the case of the "incongruent" target (this case is referred to as the "incongruent condition of the target group) and the condition when no such resolution should take place (it is referred to as the neutral condition of the target group). An increased tendency towards addiction to short video corresponded to a decrease in the increase in the prefrontal theta power in solving cognitive conflict. This finding was also high despite the adjustment of covariates (gender, age, anxiety and depression). Notably, it was task-specific, since no significant connection was observed between the MPSVATQ scores and theta power activity in resting state EEG recording at the outset and after the task. The pattern suggests that the person with a greater degree of addiction will have less neural activation of the prefrontal cortex when needed to perform executive control resources of the task that does not necessarily imply an apparent deficiency in behavior itself.

Moreover, at questionnaire level, a considerable negative relationship was found between MPSVATQ scales and SCS scales, that is, the higher the tendency to be addicted to short video, the less the self-reported self-control ability. This has been consistent with the larger theories of addiction in terms of impaired self-control.

Finally, the given research includes convincing neurophysiological data that a propensity to mobile phone short-term video addiction has been linked to the functional shortage in the executive control network of the brain. The fundamental finding is that this deficiency manifests itself as lower prefrontal theta oscillatory activity in conflict processing, a brain code of weaker control of cognitive processes. The authors explain these results in the framework in which the high engagement caused by low-effort content in short-form video may have a chronic negative effect on the low-order areas of the brain engaged in reward and emotion, but inhibitory effect on the high-order prefrontal areas engaged in top-down regulation. Such a tendency might not only expose the risk of addiction, but also reduce the self-control and attentional abilities in the long run. The research emphasizes the fact that it is better to consider the cognitive implications of the current digital habits not only through the lenses of behavioral activities but also in terms of neural markers. It ends by recommending that interventions to promote self-control in alleviating the adverse effects of short-form video addiction such as mindfulness-based training might be useful. The article also recognizes weaknesses, such as cross-sectional design, sampling characteristics, and the necessity of future studies on the same that use longitudinal designs, demographically more diverse populations, and additional neuroimaging methods, such as fMRI.

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## 3. Influence of short videos on attention span

This research is exploring the ambiguous connection between short-form video content (e.g. on such sites as Tik Tok, Instagram Reels, Youtube Shorts) consumption and its subsequent effect on the attention span and academic performance of students. The authors utilize the mixed-methods research design, which implies the usage of both the quantitative surveys and qualitative interviews to investigate this phenomenon. The main goal is to fill a identified research gap of determining a direct correlation between digital distractions as a result of short video consumption and real educational results, which, according to the authors, has been neglected by other prior research.

The quantitative phase methodologically was performing a survey of more than 200 student participants and separating them into three categories according to their daily consumption of short videos: Category 1 (around 1 hour), Category 2 (1-3 hours), and Category 3 (more than 4 hours). They used their 10-th and 12-th grade examination scores as indicators of academic performance. The correlation and regression statistical calculations were made to test the correlation between screen time (the independent variable) and academic scores (the dependent variable). The qualitative stage entailed 10 students that were classed as heavy users (Category 3) and in-depth semi-structured interviews to get access to their personal views on attention and focus [3].

The numerical results show that there is a serious trend that is very worrying. Although there was no significant difference in the performance of the students with moderate use (Category 1), students in Category 2 had slight reduction in their 12-th-grade scores and weak negative correlation, the extent of such influence was intense in heavy users. The students in Category 3, where students spent more than 4 hours a day on short videos, showed a significant deterioration in performance. They got high mean scores (~69.3) in 10-th grade which the interviews that followed, was explain by less exposure at that earlier stage. But in 12-th grade their average scores reduced greatly (~63.9). Importantly, this group demonstrated a moderate negative correlation (-0.3217) between the time spent watching short videos and 12-th-grade marks. Regression analysis also suggested a strong downward trend that is highly indicating that higher consumption is correlated with deteriorating academic performance in important later years of school.

The qualitative data of the surveys and interviews is a potent supplement to the statistical one that gives context to the observed correlation. Thematic analysis indicated a number of self-reported difficulties between the students, especially the heavy users. Major themes involved a general ignorance of focus and lack of productivity with students saying they could not concentrate on academic work. Numerous considered short video usage as a time wastage. Moreover, the students indicated that they had challenges in remembering the information shown in the videos they had watched. Interviews emphasized the desire to get immediate satisfaction that meant that there was a diminished pleasure and patience towards content which took a long time to consume such as movies, books and lectures. Other issues that had been reported included being more distracted by the activity or noises around, having the propensity to procrastinate duties that involve deep thinking, and even forgetting about events and commitments.

These behavioral and cognitive impacts are explained by the authors in terms of neurochemical process, which is connected with the dopamine reward system in the brain. They affirm that the convenient and stimulating quality of short videos can cause a Chronic Dopamine Deficit State, with the brain being conditioned to crave immediate and constant stimulation, and they believe that in so doing they destroy the ability to focus long-term (academic work).

Conclusively, the study has provided strong evidence that too much short videos have adverse effects on attention and academic performance. The correlation is statistically proved in the form of decreasing grades, and qualitatively backed by students themselves, sharing their experiences of lack

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of concentration and being in the grip of their mind. To solve this problem, the paper suggests a complex set of solutions (including personal activities, such as uninstalling apps, digital wellbeing tools, etc.), educational awareness training among students, parents, and teachers, as well as the encouragement of technology-based interventions (e.g., screen time tracker apps) to develop responsible habits with technology. The paper admits its first weakness the limitation in the budget that did not allow it to employ more sophisticated technology to directly, objectively measure the attention span and instead leaves it to self-reported items [8].

## 4. Impact of short videos on student performance

In 2020, the COVID-19 pandemic led to increased use of online teaching in institutions of higher learning, and the flipped classroom has become one of the central models of instruction because of its benefits of being student-centered. Educational videos, as the main learning resources, are important components of online-flipped courses, but only a quantitative study of how the length of the video influences the results of the learning process in credit courses was limited, in particular, college programs. To fill this research gap, a research team carried out a study of Introduction to Engineering Drawing, a mandatory course of Freshmen majors in Mechanical Engineering at the University of Suzhou City about the impact of short videos implementation in online-flipped engineering courses during the pandemic [9].

The total group of 65 undergraduate students who had similar scores of the National College Entrance Examination was randomly split into a long-video group (35 students) and a short-video group (30 students) and no significant differences were observed between the basic learning abilities of the two groups. In the case of instructional videos, long-video group was assigned the same material within 55-minute videos of the same length as the offline classes, whereas the short-video group was assigned the same material divided into 8 min short videos each of which had a complete knowledge point. All courses were delivered via an online virtual learning platform: students engaged in self-paced pre-class video learning, participated in student-centered interactive activities (e.g., group discussions, Q&A sessions) during 2-hour online classes, completed post-class assignments, and took a unified final exam under online proctoring. A 9-item five-point Likert scale questionnaire was administered to collect subjective perceptions, and quantitative data including video viewing time and final exam scores were analyzed using statistical methods such as the Mann-Whitney U test and one-way ANOVA to ensure methodological rigor.

The study validated two core research hypotheses. First, short videos significantly enhanced student engagement: the median video viewing time of the short-video group was 24.7% higher than that of the long-video group, with over 70% of students watching more than three-quarters of the video content. The short-video group also showed smaller variance in viewing time, indicating more stable engagement, and some students even rewatched videos, resulting in total viewing time exceeding the video duration itself. Second, short videos effectively improved academic performance: the median and average final exam scores of the short-video group were 7.4% and 9.0% higher than those of the long-video group, respectively, with a smaller standard deviation in scores reflecting more consistent performance. This difference was statistically significant. As well, questionnaire scores showed no major differences between students in terms of internet skills or the subjective attitudes to the course and instructional model of the two groups. Although both groups reported similar self-perceived concentration and information retention, the objective gap in exam scores demonstrated that short videos actually improved students' knowledge acquisition. Long-video group also indicated greater video pausing/rewinding, and the level of perception of excessive video length.

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The study also identified a key finding distinct from previous MOOC research: students in credit-bearing courses exhibited significantly longer video viewing times than those in non-credit MOOCs. It means that degree assessment is an effective measure to stimulate the learning initiative of students and offer more flexibility in designing videos to instructors, so they do not have to rely on the 6-minute standard suggested in MOOC research. The positive effects of short videos stem from their ability to reduce students' extraneous cognitive load, helping them organize and integrate information more effectively and focus on germane cognitive tasks—an outcome aligned with Cognitive Load Theory and the Cognitive Theory of Multimedia Learning. The study acknowledged a limitation: current technology cannot verify whether students actually watched the videos, which may have minor impacts on the results.

On the basis of the research, the research team offered specific recommendations related to the online-flipped engineering classes within the educational system. The instructors must (1) make short instructional videos, which consist of a single knowledge point each; (2) directly connect what will be covered in the classes (as reflected in short videos) with interactive activities in the classes, and design specific questions to be discussed afterwards (that require repetition); and (3) allow students to digest the information and discuss their doubts directly after covering each knowledge point in the classes (in accordance with the Cognitive Load Theory).

This study represents the first quantitative investigation into the effects of short videos in credit-bearing online-flipped college engineering courses during the pandemic, empirically confirming that short videos significantly enhance student engagement and academic performance. It also offers concrete empirical support on designing the curriculum of online-flipped courses in the future. The research team noted that future work will explore more factors influencing video teaching effectiveness (e.g., video quality, viewing devices, viewing scenarios), incorporate more qualitative research methods, extend the study to additional engineering courses, and conduct longitudinal research to improve the external validity of the findings, thereby offering a more comprehensive reference for the optimization of online teaching models.

## 5. Conclusion

This essay based on three recent empirical studies, summarizing the impact of short videos usage on human cognitive function and academic performances. The existing research evidence indicates that, short videos exert a negative impact on concentration ability, through behavioral habits, and cognitive system. Firstly, there is a significant negative correlation between the duration of short video usage and academic performances. The research revealed that as the duration of video viewing increases (especially when exceeding 4 hours per day), students' performance in standardized tests shows a downward trend. Additionally, students generally reported subjective experiences such as "inability to concentrate", "feeling brain fatigue", and "decreased productivity" after frequently watching short videos. Secondly, long duration of short video usage can lead to cognitive overload and concentration deficiency. It is pointed out that the rapid switching and frequent stimulation of short videos have pushed the brain's ability to process information to its limit, leading to cognitive overload. This state makes it difficult for the brain to maintain the necessary cognitive resources for subsequent academic tasks. In addition, frequent consumption of short videos encourages "media multitasking", and when dealing with boring academic tasks, the ability to filter irrelevant information (i.e., cognitive control ability) decreases. Based on the above literature, the impact of short-video addiction on attention is a continuous process that starts with neurophysiological changes (inhibition of prefrontal function) and progresses to cognitive decline (impairment in executive control and working memory), ultimately leading to behavioral consequences (decline in

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academic performance and procrastination). The current studies are mostly cross-sectional or short-term observations, lacking long-term longitudinal research to confirm the persistence of causal relationships.

## Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

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