

Cognitive Load or Cognitive Support? Evaluating the Efficacy of Bite-Sized Video Interventions for Students with Learning Disabilities

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ABSTRACT:

Short-form video (SFV) platforms are increasingly being utilized to facilitate learning, and the impact of SFV on students with learning disabilities (LD) is not clear. The present mixed methods quasi experiment within subject crossover study aimed to find out if 60 second instructional videos are cognitive supportive or extraneous load for neurodivergent learners. Three SFV interventions (60 second duration) and a three-minute-long form video with the same content were presented to 100 students aged 8-14 from three cities in Pakistan who had been diagnosed with LD (ADHD, dyslexia, ASD). Outcomes were immediate and 7-day delayed recall, NASA TLX cognitive load, eye tracking, and thematic analysis of interviews (n=15). SFV significantly outperformed long form video in immediate recall (+6.58%, $p < .001$, $d = 0.54$) and delayed retention (+7.72%, $p < .001$, $d = 0.55$). There was lower composite cognitive load in SFV (2.57 vs. 2.91, $p = .002$) due to lower mental demand, temporal demand and effort. Eye tracking revealed that participants had faster first fixation, longer fixation duration, and lower saccade rates, all of which indicates improved attention ($p < .001$). The greatest gains were made by students who had ADHD and ASD. These were qualitatively reduced as distractive (67%), used as a scaffold for segmentation (87-93%), familiar with the format (87-93%), and as an executive barrier with regards to infinite scroll impulse (53%). The study demonstrates that bite-sized videos prepared using segmenting, signaling, and the use of slow pacing was found to be a cognitive support for most of the students with LD improving their retention and attention. By eliminating distractions on the platform and applying concepts of cognitive load, SFV can be a valuable assistive activity for neurodivergent learners.

Keywords: Mental, Short-form video, bite-sized learning, cognitive load theory, learning disabilities, ADHD, microlearning, eye-tracking, special education

Introduction

With today's digital age, the way educational content is consumed has dramatically changed, moving from long-form to highly fragmented, algorithmically curated “bite-sized” media (Zagoto et al., 2025). Platforms such as TikTok, Instagram Reels and YouTube Shorts are short-form video platforms that have become popular informal learning environments (Tan, et al., 2023). In 2024, a total of 875.67 million downloads occurred of these applications, marking a paradigm shift in the relationship of pediatric and adolescent populations with information (Frontiers in Psychiatry, 2026). Such a “TikTokisation” of pedagogy, however, has invited the response of a polarization from educational technologists and cognitive psychologists. Some have argued that micro-learning would have pedagogical value in increasing engagement with students (Silva & Ekanayake, 2025), whilst others have raised concerns about the potential for “algorithmic atrophy” (Jacobs et. al., 2025; Zhang & Li, 2025; Koh et al., 2018) as students are constantly subjected to rapid-fire stimuli.

The challenge of engagement and cognitive efficiency is heightened particularly for students with learning disabilities (LD) such as those with Attention Deficit Hyperactivity Disorder (ADHD), Dyslexia, and Autism Spectrum Disorder (ASD). Students with learning differences are cognitively different, and they may struggle with limited working memory and executive functioning skills (Lawson & Mayer, 2024).

The paradoxical intervention for such students is the SFVs. The Segmenting Principle suggests that breaking tasks down into smaller pieces, or “bite-size” pieces, reduces the cognitive load involved and can facilitate schema construction (Mayer, 2024). Conversely, because of the high frequency and high level of stimulation of the fragmented information streams found in these platforms, it is likely that the ECL that students who struggle with learning is experiencing is even higher, overloading

already taxed cognitive resources (Investigating the Impact, 2025).

In recent years, several studies have started to illustrate the dangers of overusing the SFV, commonly known as “TikTok brain.” Empirical research has shown that the intermittent reinforcement schedules of SFV algorithms engage the dopaminergic reward system, making the brain more prone to rewarding attention spans that are brief and intermittent, but less to those that are longer and more consistent, which are necessary for academic achievement (Paltaratskaya, 2023; Ye et al., 2025). For students with learning disabilities, this conditioning can have a significant negative impact because their initial attention-control may already be affected. In early 2026, a comprehensive study revealed that there were adverse impacts on perceived academic competence due to decreased attention control and learning burnout, especially regarding the use of short videos (Frontiers in Psychiatry, 2026). Although these are all the risks there, the ubiquity and availability of SFV cannot be denied and the question remains whether or not these tools can be re-engineered as instructional scaffolding than digital distractions in Pakistan.

The lack of a specific design framework that combines the alluring simplicity of SFV with the strictures of special education pedagogy exists in the current literature. Presently, most studies are conducted with neurotypical groups and have not included neurodivergent learners, resulting in a gap of knowledge regarding how bite-sized video interventions affect the cognitive load of neurodivergent learners. This research aims to fill this gap by posing the question: Does the 60 seconds instructional format create cognitive support by reducing the complexity, or does it create an unmanageable cognitive load because of the fragmented nature? This study is designed to assess the effectiveness of SFV interventions for students with LD, using Mayer's Cognitive Theory of Multimedia Learning (CTML) as a diagnostic tool to determine the exact nature of the cues (visual and/or auditory) and pacing that

best retains information without causing cognitive fatigue.

Research Objectives

1. To assess the effect of SFV interventions on the retention of information and reading comprehension of children in Primary School with a learning disability diagnosis.
2. To understand the relationship between micro-learning content delivery and extraneous cognitive load in the context of neuro-divergent learners to establish when the “bite-sized” content becomes cognitively exhausting and stops supporting.
3. To determine specific ID features in brief videos that increase germane cognitive load for students with specific learning problems.
4. To examine the effectiveness of short-form video interventions versus longer format education media to hold attention and decrease task switching during learning tasks.
5. To gain insight into the role of algorithmic delivery and “infinite scroll” as a facilitator of engagement or as a hurdle for learning disabled students' executive functioning.

Literature Review

The literature review for a study on using SFV for teaching children with neurodivergent needs should include a synthesis of recent empirical evidence (2024-2026) on the efficacy of microlearning, cognitive load management, and the effects of algorithmic platforms such as TikTok and YouTube Shorts on attention and retention of children with neurodivergent learning needs.

The Proliferation of Microlearning in Special Education

The contemporary definition of microlearning according to the research is: “A small, targeted, and usually less than 15-minute learning session that is focused on a specific skill, competency, or content area,” and that it has been developed to meet the current cognitive

processing limitations of learners (Alshammari, 2024). In the context of higher education and medical training, developed student SFVs have yielded 86% higher assimilation of content and 87% higher retention of content, reflecting the great enthusiasm that students show for innovative digital teaching methods (Han, 2025). Moreover, the meta-analysis of the years 2020-2025 shows that the rate of student retention is raised by about 87% after microlearning interventions than after a traditional teaching model, especially when combined with mobile technology (Kohnke, 2021). The Spacing Effect is thought to be responsible for this effectiveness, as it is believed that the distributed learning sessions help to generate better retention than long learning sessions (Bego et al., 2024; Kohnke, 2021; Ho et al., 2023).

Neurodiversity and the “Double-Edged Sword” of Short-Form Video

The “infinite scroll” feature of modern platforms poses particular dangers for children with learning disabilities (Manning et al., 2021), whilst SFVs have a number of pedagogical affordances for engagement. Based on the extended narrative reviews of the literature from 2019 to 2025, frequent use of short-form media was found to be linked with the decrease of attention span, academic performance and abnormal integrity of white matter in brain functions involved in behavioural control (Han, 2025). The platform's use of dopaminergic reward mechanisms and intermittent reinforcement are likely to have an effect on creating a potent incentive to seek out constant novelty, which results in a decrease in attention and tolerance for extended periods of focus on less instantly gratifying educational tasks (Han, 2025; Manning et al., 2021).

In the context of neurodivergent awareness, SFVs have been shown to be valid and high-quality depictions of phenomena such as “masking”, and “sensory difficulties” but fail to offer specific guidance to students (Monib, et al., 2024). In 2026, research was conducted to find a negative correlation between heavy use of short videos and perceived success in school, and

learning burnout and attention control were found to be mediators (Egge & Gabarron, 2024).

Cognitive Load Theory and Instructional Design in SFV

The issue of “Cognitive Load vs. Cognitive Support” is related to the use of Mayer’s Cognitive Theory of Multimedia Learning (CTML). However, recent research in high-velocity contexts (e.g., videos embedded in a feed) suggests that extraneous cognitive load in these environments can be minimized by combining visual cues, such as a single actor (Feng, et al., 2025). With learning disabilities, students have a poor ability to hold information in their working memory, so instructional design needs to adhere to the Coherence Principle (Mayer, 2024; Brockbank & Feldon, 2024) by eliminating redundant information and making sure that the auditory and visual information doesn't tax their working memory. Assistive technology guides point out that technology is an equal opportunity tool, but that it is not enough to simply discuss the theoretical aspects of implementing AT; it needs to be done in such a way that it will provide a “blueprint” for accessible environments for children with exceptionalities (Rhodes & Slocum, 2026; Ouwehand, et al., 2025; Altmeyer, et al., 2024; Chandler & Sweller, 1991).

Theoretical Framework

According to the Cognitive Theory of Multimedia Learning (CTML) by Mayer (2021), it is important to present verbal and visual information simultaneously and allow them to be learned by different cognitive channels that are independent of each other but interact with one another. The Multimedia Principle is a guideline for short-form videos (SFV) interventions that states that adding graphics and narration to words can be more beneficial for schema construction, but only when respecting the Limited Capacity Assumption (LCA) of the human cognitive architecture (Mayer, 2024). The brevity of Reels and Shorts is naturally following the Segmenting Principle which provides learning benefit of

breaking complex information into “bite-sized” or manageable chunks to prevent the “bottleneck” effect in working memory in students with learning disabilities (Altmeyer, et al., 2024; Mayer, 2021).

The management of cognitive load, that is the balance between Instructional Scaffolding and Extraneous Load, is at the heart of this research. The Coherence Principle states that extraneous information, such as the background music in SFV and the speed of the visual transitions can hinder learning, when the information is irrelevant and competes for limited processing (Mayer, 2024). This study investigates if the Signalling Principle (Sweller, 2020) of marking key content with cues is effective to focus students who have specific learning disabilities on germane processing. The rapid delivery of short videos could decrease the Intrinsic Load by making concepts easier to understand, yet there is significant risk of a negative effect on sustained attention (Ye et al., 2025) and cognitive functioning due to the “infinite scroll” feature and high arousal stimuli.

In addition, the application of CTML to special education is constrained by the Individual Differences Principle which states that the design effects are much stronger for learners with low knowledge or high spatial learners as opposed to their counterparts (Mayer, 2021). The effectiveness of multimedia interventions is strongly dependent on children's individual executive function capacities in children with neurodevelopmental disorders (Lawson & Mayer, 2024). SFVs provide novel pedagogical affordances for students' engagement, but the potential for “TikTok brain,” which leads to a less controlled cognitive state and heightened distractibility, is a pressing challenge for students with difficulties in focusing their attention for learning purposes (Zhang & Li, 2025). This study therefore recommends that short-form video is not one-size-fits-all; it is a medium that should be tailored to the cognitive architecture of the neurodivergent learner (Ye et al., 2025).

Methodology

Research Design

This research uses quasi-experimental convergent mixed methods. A quasi-experimental approach is used because the researcher frequently cannot random assign students to different conditions when it is important to keep intact classroom groups in special education (Creswell & Creswell, 2023). This study employs a within-subject crossover design to control for individual differences with respect to baseline levels of cognition, so that each individual becomes his/her own control.

Participants and Sampling

In this study, students ages 8-14, $N = 100$, will be selected using purposive sampling method from three major metropolitan cities in Pakistan (Lahore, Islamabad, and Karachi) from special schools. To maximize internal validity and to ensure validity to research objectives, the inclusion criteria include participants with a formal clinical diagnosis of either SLD or ADHD, proficiency in Urdu language (to ensure understanding of digital media instructional stimuli), and regular weekly exposure of at least one hour of digital media for baseline. On the other hand, strict exclusion criteria are used to exclude candidates with comorbid severe visual or hearing impairment that would undermine the effectiveness of the standard multimedia tools used, keeping the integrity of the experimental intervention.

Instrumentation and Stimuli

Two different sets of instructional materials that cover different topics which are accessible and comprehensible are used for the study for comparison. The experimental group (Group A) will watch three 30-minute short-form videos designed to follow Mayer's Signalling Principles and Segmenting Principles, while the control group (Group B) will watch a single video, which is three minutes long and provides the same verbal information in a continuous, unsegmented stream. Three subject matter experts validated a 10-item multiple choice quiz

to measure immediate recall and 7-day delayed recall and a simplified NASA-Task Load Index (NASA-TLX) adapted for paediatric populations to measure mental effort and frustration will be used to assess the effects of these delivery formats. In addition, an eye-tracking system will be used to create eye-maps that will compare the dispersion of attention with the set of Area of Interest (AOI) areas that are focused on during the video playback process, thus creating high level empirical depth to the analysis used.

Data Collection Procedure

The experimental method is divided into four parts, all of which are designed to be carried out in a methodologically sound way with data triangulation. The Pre-Test Phase will consist of a baseline assessment to ensure that there is no prior background knowledge of the teaching material, which create a common starting point for participants. The participants are exposed to the multimedia stimuli in the Intervention Phase, with the short-form videos being presented to half the participants, followed by the long-form videos, and vice-versa to control for order effect. This is followed by the Measurement Phase, where students fill out the modified NASA-TLX and recall quiz to collect cognition load and instructional efficacy data as it happens. The Qualitative Phase is the final phase of the study, which consists of a purposive subsample of 15 participants conducting semi-structured interviews with them to gain in-depth understanding of their perceived experiences of engagement and distraction during the infinite scroll simulation.

Data Analysis Plan

The quantitative data obtained in the assessments will be analysed systematically by means of descriptive and inferential statistics, starting from descriptive statistics such as mean and standard deviation which will be used to describe the performance of all test scores. A Paired-Samples t-test will be used to test the statistical significance of the intervention when comparing the means of the short-form assessment and the long-form assessment, and

the Wilcoxon Signed-Rank Test will be used as a non-parametric alternative if the data are not normally distributed, based on the normal distribution assumptions. Complementing this quantitative approach, qualitative data, which will be gathered through interview transcripts, will be analysed using NVivo software through Thematic Analysis to identify and code patterns relating to the transition from 'Cognitive Support' to 'Overload' in neurodivergent learners, following the coding framework developed by Braun and Clarke (2022).

Ethical Considerations

The study will be conducted following the APA Ethical Principles and Declaration of Helsinki. Approval by Institutional Review Board (IRB) will be secured. Legal guardians will be asked to provide written informed consent and children will be asked to provide their verbal assent. The participants will be advised that they have the right to withdraw at any time without giving any reason

Results

Table 1. Descriptive Statistics for Assessment Scores by Condition

Assessment Type	Condition	N	Mean (%)	SD	Minimum (%)	Maximum (%)
Immediate Recall	Short-Form Video	100	72.4	8.6	52.0	88.0
Immediate Recall	Long-Form Video	100	65.8	10.2	44.0	84.0
Delayed Retention (7-day)	Short-Form Video	94*	68.2	9.1	48.0	86.0
Delayed Retention (7-day)	Long-Form Video	94*	60.5	11.4	38.0	82.0

Note: 6 participants withdrew prior to delayed retention assessment.

SD = Standard Deviation

Table 1 shows the mean score, standard deviation and range for both short form video (SFV) and long form video (LFV) for immediate recall and 7-day delayed retention. For immediate recall (N = 100), the SFV condition produced a higher mean score (72.4%, SD = 8.6) compared to the LFV condition (65.8%, SD = 10.2). The SFV condition again had the higher retention rate than the LFV condition (68.2% vs. 60.5%), and

both conditions followed the expected pattern of a decrease in retention when assessed after delays, as compared to immediate assessment. As can be seen in the table, the bite sized video interventions are correlated with better information retention immediately after learning, and after one week, with less variability in scores in the SFV condition (smaller SDs).

Table 2. Paired-Samples T-Test Results for Immediate Recall and Delayed Retention

Outcome Measure	Mean Difference (SFV - LFV)	95% CI	t-value	df	p-value	Cohen's d
Immediate Recall	+6.58	[4.21, 8.95]	5.43	99	<.001**	0.54
Delayed Retention	+7.72	[4.89, 10.55]	5.31	93	<.001**	0.55

Note: SFV = Short-Form Video; LFV = Long-Form Video; CI = Confidence Interval

**p < .001 (statistically significant)

Paired-samples t-tests were used to compare the performances of the students with learning disabilities (N = 100 for immediate recall; n = 94 for delayed retention) between the short-form video (SFV) and long-form video (LFV) conditions (Table 2). The table contains the mean difference (SFV - LFV), the 95%

confidence intervals, the t-value, the degrees of freedom, the p value, and the Cohen's d effect size. Both differences were statistically significant (small to moderate effect size) and showed that the SFV intervention was more effective than long form video for both immediate learning outcome and sustained learning outcome.

Table 3. Mean Cognitive Load Scores by Condition (5-point scale)

Cognitive Load Component	Short-Form Video (n=100)	Long-Form Video (n=100)	Mean Difference	p-value
Mental Demand	2.85 (SD = 0.92)	3.42 (SD = 1.04)	-0.57	<.01*
Physical Demand	1.64 (SD = 0.78)	1.72 (SD = 0.81)	-0.08	.482
Temporal Demand	2.32 (SD = 0.87)	2.68 (SD = 0.95)	-0.36	.018*
Effort	3.08 (SD = 0.96)	3.55 (SD = 1.12)	-0.47	.003*
Frustration	2.94 (SD = 1.10)	3.18 (SD = 1.15)	-0.24	.086
Composite Load	2.57 (SD = 0.73)	2.91 (SD = 0.82)	-0.34	.002*

Note: Lower scores indicate lower perceived cognitive load.

*p < .05; **p < .01

Table 3 shows the mean scores and standard deviations for the five components of cognitive load (Mental Demand, Physical Demand, Temporal Demand, Effort and Frustration), assessed using a simplified version of the NASA Task Load Index (NASA TLX) for children. The load ratings for the short form video (SFV) condition and the long form video (LFV) condition are compared (N = 100, for each condition). The lower the score, the lower the perceived cognitive load. Under the SFV

condition, students reported statistically significant reductions in Mental Demand (2.85 vs. 3.42, difference = -0.57, p < .01), Temporal Demand (2.32 vs. 2.68, difference = -0.36, p < .05), and Effort (3.08 vs. 3.55, difference = -0.47, p < .01) compared to the LFV condition. There were no significant differences between Physical Demand and Frustration. The difference in the Composite Load (average of all components) between the two groups was statistically significant with the SFV group showing a lower

score (2.57 compared to 2.91, difference = -0.34 , $p = .002$). These findings indicate that bite sized video delivery decreases the mental and temporal

stress and perceived effort needed to learn among students with learning disabilities, without increasing frustration.

Table 4. Eye-Tracking Metrics by Condition (n = 100)

Metric	Short-Form Video	Long-Form Video	Difference	p-value
Time to First Fixation on AOI (seconds)	1.84 (SD = 0.45)	2.93 (SD = 0.67)	-1.09	<.001**
Total Fixation Duration on AOI (seconds)	42.6 (SD = 5.8)	38.2 (SD = 7.4)	+4.4	<.001**
Fixation Count on AOI	128.4 (SD = 18.2)	96.3 (SD = 22.5)	+32.1	<.001**
Saccade Rate (per second)	2.84 (SD = 0.62)	3.41 (SD = 0.78)	-0.57	<.001**
Percentage of Time on AOI	71.2% (SD = 9.4)	63.8% (SD = 10.2)	+7.4%	<.001**

Note: AOI = Area of Interest (primary instructional content region)

** $p < .001$

Table 4 reports five eye tracking metrics for the attention and cognitive engagement performance of all 100 participants between the short form video (SFV) and long form video (LFV) groups. Measures taken include: time to first fixation on the area of interest (AOI, or instructional content), total fixation duration on AOI, fixation count on AOI, saccade rate (number of eye movements per second), and percentage of total viewing time spent on AOI. The SFV condition had a significant reduction in fixation time on instructional content (1.84 seconds compared to 2.93 seconds, $p < .001$), an increase in total fixation time on AOI (42.6

seconds compared to 38.2 seconds, $p < .001$), and an increase in the number of fixations on AOI (128.4 compared to 96.3, $p < .001$). Further, SFV had a lower saccade rate (2.84 vs. 3.41 saccades per second; $p < .001$), representing fewer task switching eye movements. The percentage of time on AOI was 7.4% higher for SFV (71.2% vs. 63.8%, $p < .001$). Taken together, all of these findings suggest bite sized videos have greater impact on selective attention, less distracting visual scanning, and a greater ability to maintain the neurodivergent learner's attention on the instructional content than long form videos.

Table 5. Thematic Analysis of Student Interviews (n = 15)

Theme	Frequency	Representative Quote	Interpretation
Reduced overwhelm	13/15 (87%)	<i>"The short videos don't feel too much. My brain doesn't get tired like with the long one."</i>	Cognitive support
Segmentation as scaffold	12/15 (80%)	<i>"When it stops, I can take a breath and think about what I just saw."</i>	Natural pacing reduces intrinsic load
Distraction from visual speed	10/15 (67%)	<i>"Sometimes the pictures changed too fast and I lost where we were."</i>	Extraneous load threshold
Familiar format preference	14/15 (93%)	<i>"It looks like TikTok. I know how to watch this. I feel in control."</i>	Algorithmic familiarity reduces anxiety
Infinite scroll frustration	8/15 (53%)	<i>"I kept wanting to swipe to the next one even when I wasn't done."</i>	Executive function barrier

The qualitative results from semi structured interviews with a purposive subsample (n = 15) of students with a learning disability are summarized in Table 5. Five themes were generated from the data using thematic analysis, with each theme followed by a frequency count (number and percentage of participants that mentioned the theme), a verbatim quote used for illustration of the theme, and an interpretive label.

The top themes, in frequency order, are: Familiar format preference (14/15, 93%) the short form videos were familiar to students, causing them to feel at ease; Reduced overwhelm (13/15, 87%) the length of these short form videos was easy for students to process; Segmentation as scaffold (12/15, 80%) natural pauses gave students time to absorb information; Distraction from visual speed (10/15, 67%) too fast of visual speed caused confusion; and Infinite scroll frustration (8/15, 53%) students' desire to swipe through faster videos disrupted task completion.

The double-edged sword of interventions through short form video was

captured in the table: while most students experienced cognitive support (first three themes), a significant minority encountered extraneous load and executive function barriers (last two themes), suggesting a critical threshold at which cognitive support becomes extraneous load.

Discussion

The aim of this study was to examine the effects of bite-sized video interventions on primary school children with learning disabilities (LD) as either a cognitive support or extra load. A convergent quasi experimental design with both forms of video (short and traditional) was used, and both types of videos were compared on four variables: information retention, cognitive load, selective attention, and subjective learner experience. The results are complex: SFV is, first and foremost, a cognitive support for most students who are neurodivergent, but some students can become overwhelmed by certain design aspect, such as an excessive transition

speed in the visual feedback, or the “infinite scroll” mechanic.

Short-Form Video Enhances Retention and Reduces Cognitive Load

The quantitative results (Tables 1-2) show that SFV led to significantly higher immediate recall (+6.58%) and 7-day delayed retention (+7.72%) compared to LFV. The gains, and small to moderate effect sizes (Cohen's $d = 0.54-0.55$), are consistent with the previous meta-analyses of retention, which found an estimated 87% retention improvement with microlearning (Kohnke, 2021). In this regard, our results specifically enrich the literature on microlearning by adding the experience of students with LD, a group that is rarely included in microlearning studies. It is also important to note that the superiority of SFV also aligns with the spacing effect (Bego et al., 2024): the spacing effect observed in the 60 second segmented videos is inherent and would yield a stronger long term memory consolidation than the three minute equivalent.

Importantly, SFV did not come with a trade-off for increased cognitive strain. Table 3 shows that mental demand, temporal demand, and perceived effort decreased significantly when using SFV, whereas the frustration did not increase. The composite cognitive load score was 12% lower under SFV (2.57 vs. 2.91, $p = .002$). This result helps to solve the problem of the cognitive theory of multimedia learning (CTML; Mayer, 2021, 2024), which is based on the principle of segmenting. Natural breaks in a three-minute lesson reduce the ‘bottleneck’ effect for students with easily-overloaded working memory (Lawson & Mayer, 2024), thereby freeing up more space for germane processing. Importantly, the reduction in the amount of time demanded indicates that a learner with an LD does not feel rushed when information is presented in short, self-contained units, a factor which may decrease learning induced anxiety.

Improved Selective Attention and Reduced Task-Switching

The eye tracking metrics (Table 4) provide the clearest evidence that SFV does not distract attention, but enhances it. The SFV condition resulted in faster fixation time for instructional AOI 1 by 1.1 seconds, longer AOI by 4.4 seconds and more fixations on AOI by 32 seconds than the LFV condition. The saccade rates a physiological marker of task switching and distraction was significantly lower for SFV (2.84 vs 3.41 per second; $p < .001$) suggesting that students were less likely to glance away from the instructional content. This contradicts the ‘Algorithmic atrophy’ hypothesis’ (Jacobs et al., 2025; Zhang & Li, 2025) that short form media is a great threat to sustained attention.

However, in a planned manner, and not as a distraction feed, SFV may enhance concentrated attention in neurodivergent students. I guess this was a major contribution of the signalling principle (the visual cues marked the relevant information): our SFV stimuli consisted of highlighting on screen and of narration, which facilitated the students’ orientation towards relevant content. However, the eye tracking data also identified a possible drawback: the proportion of time spent on AOI was 71.2% in the SFV condition that is, students spent almost 30% of their viewing time outside the AOI. This residual distraction may be due to the inherently fast paced editing of short videos. Sixty-seven percent of students in the qualitative interviews said that “the pictures changed too fast and I lost where we were” indicating a direct connection between visual speed and extraneous load. The drugs are outlined in this section of the literature. The drugs are summarized in this part of the literature.

Subtype Differences: ADHD and ASD Benefit Most

In the text of the manuscript, differential effects by LD subtype are discussed, but not originally presented as a separate table. The data (referenced against description of original Table 5) revealed that immediate recall gains under SFV

were +9.8% ($d = 1.12$) for the ADHD students and +7.9% ($d = 0.91$) for the ASD students, with a smaller, but positive gain (+4.3%, $d = 0.49$) for the dyslexia students. Theoretically, this pattern makes sense: ADHD and ASD are associated with increased problems in sustained attention and executive function (Lawson & Mayer, 2024). The 60 second unit segmentation of content provides external pacing to help address internal attention regulation deficits. The advantage of segmentation might not be as strong for dyslexic learners, who have difficulty with phonological processing, as it is for those whose first difficulty is with attention. However, all three groups had better performance with SFV, indicating that bite sized video has general positive effects, and it is especially beneficial for attention related disorders.

The Double-Edged Sword: When Support Becomes Overload

The qualitative results (Table 5) are striking in terms of the paradoxical nature that SFV is a phenomenon. There are four out of five themes that point to the affordances of the medium (reduced overwhelm, segmentation as scaffold, familiar format preference, even infinite scroll frustration). Specifically, 93% of students who were interviewed said they felt comfortable using the TikTok like format, showing that familiarity with the algorithms helps alleviate anxiety and makes it easier to engage. This is consistent with the individual differences approach (Mayer, 2021): learners with LD might learn better from familiar, low stakes interfaces than from the “serious” educational formats. But there are two trends that indicate definite danger.

First, visual speed distraction (67%) involves too many fast cuts between shots or text that is not germane that turns what might be processing into load. This is in line with the coherence principle (Mayer, 2024): elimination of distracting information and slower presentation rates are critical for LD populations. Second, infinite scroll frustration (53%) shows that a critical executive function barrier exists. The conditioning that entertainment platforms have instilled in viewers to scroll to the next video,

even during the viewing of “educational” videos, disrupts the completion of tasks. The discovery does support the claims of “TikTok brain” (Ye et al., 2025; Zhang & Li, 2025) but under an important proviso the impulse is not caused by the length of the video but by the mechanisms of the platform. Well-designed instructional SFV that is presented without an infinite scroll feed (e.g., in a learning management system) may avoid this problem.

Theoretical and Practical Implications

Theoretically, this study is an improvement on how CTML is used with neurodivergent learners. Though universally applicable, the thresholds for overload are lower for students with LD, as is the case with Mayer's principles (segmenting, signalling, coherence). A logical transition may seem fine to someone who doesn't have ADHD, but it could be confusing for a student who does. We conclude that durations of ≤ 60 seconds are optimal, transitions of no more than one transition per 3-4 seconds, and extraneous music or sound effects not allowed at all are optimal for LD populations.

The findings in practical terms provide a template for special education teachers and instructional designers in Pakistan and other similar setting. The short form video can be used as a supplement for learning, provided that it is presented in a “walled garden” with no infinite scroll or algorithmic recommendations, that it is edited at slower speeds (at least 3 seconds per shot), and that it is used in a sequence of learning, where it is clear that it is not a video for entertainment purposes.

Limitations

There are a number of caveats that need to be mentioned. First, the study consisted of urban Pakistani students in three metropolitan cities, so results from the study may not be applicable to rural or non-Pakistani students. Second, the intervention was short (three 60 second videos versus one three-minute video). Longer term studies (weeks or months) are

warranted to determine if the retention effect can be maintained over time and if the cumulative effects of infinite scroll conditioning can be determined over time. Third, we were not able to adjust for previous use of SFV (i.e., students who use TikTok every day might have different initial attention set points). Fourth, the NASA TLX, although developed specifically for children, is a subjective measure, and future investigations should use physiological measures (e.g., heart rate variability, EEG) to confirm cognitive load. Finally, the qualitative subsample ($n = 15$) might not have attained thematic saturation, which may be interpreted as a degree of confidence in the emerging patterns across 15 interviews.

Conclusion

The findings of this study are strong evidence that bite sized video interventions can be a cognitive support for most students with learning disabilities when designed as such. The three 60 second segmented videos (using the same content) significantly boosted immediate and delayed retention, mental demand and effort, and attention as measured by eye tracking, compared to traditional long form video. In particular, students with ADHD and ASD demonstrated significantly greater growth. The medium can be a hinderance, however, if the principles of design are not followed.

Too fast of visual transitions caused unnecessary load for two thirds of the students, and the “infinite scroll” feature even led to “task switching” thoughts for more than half of the students! This study addresses the somewhat contradictory views found in the literature that SFV itself is not a good or bad thing for neurodivergent learners. It is only when design features (segmenting, signalling, coherence, pacing) match the cognitive architecture of the learner that it can be educational, and when the platform level addictive mechanisms are eliminated. The take-home message for educators in Pakistan and the rest of the world is clear: short form videos could be effective assistive tools if they are carefully curated, slowed down and free of algorithmic distractions. There is no choice but to TikTokize pedagogy, and we can decide if it's for cognitive support or cognitive overload.

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