

Supplemental materials for:

Fragmented Learning from Short Videos Modulates Neural Activity and Connectivity during Memory Retrieval

Video materials

Short video materials and the long video form the core content of this study. In order to minimize the interference of irrelevant variables, we made the following controls for the characteristics of the two videos.

Duration: 10-minute short video (7 segments, 30s–1.5min each) vs. 10-minute clips from 30-minute-long video.

Content: Videos were selected from travel introduction clips, which focus on presenting scenic spots. The content is neutral with minimal emotional fluctuations and natural visuals without excessive screen flashing. This is to minimize the ability to elicit additional emotional responses (such as strong liking or disliking) from participants.

Information Density: Short video tends to have faster speech rates and denser information than long video, which potentially impact viewers differently. To control for this variable, "noninformational short video" (e.g., aerial views of a location without textual or verbal introduction) are inserted between segments. These noninformational segments do not introduce additional content. Although there are 7 segments in a short video, 2 of them do not contain information. Therefore, we controlled the total number of words per video to balance the information density.

Emotional arousal: To eliminate differences caused by the video materials, we recruited 72 participants to evaluate the videos on the basis of their emotional response and familiarity before the formal experiment. The PAD emotion scale (Li et al., 2008) was

used to assess the pleasure (1-9, from unpleasant to pleasant) and arousal levels (1-9, from calm to excited) of videos. Additionally, the Positive and Negative Affect Scale (Huang et al., 2003) was employed, where participants rated 10 positive and 10 negative emotional descriptors on a 5-point scale, with higher scores indicating more intense positive/negative emotions. Finally, participants rated their familiarity with the video content on a scale from 1 (very unfamiliar) to 7 (very familiar). The final analysis showed that neither video content elicited strong emotions and that participants were less familiar with it (see Table S2 for specific results).

TableS1. Brain activation, functional connectivity, and behavioral correlations

Group	Neural Measure	Accuracy	SVAS	SVDS	SVUSCF
Short Video	Beta: Claustrum	-0.44*	0.21	-0.14	-0.19
	Beta: Caudate	-0.20	0.41*	0.21	-0.05
	Beta: MTG	-0.13	0.19	0.10	-0.16
	FC: Claustrum–Caudate	0.12	-0.17	0.34	0.35
	FC: Claustrum–MTG	0.19	-0.20	0.21	0.38*
	FC: Caudate–MTG	-0.15	0.15	0.30	0.26
Long Video	Beta: Claustrum	0.19	0.18	-0.15	-0.06
	Beta: Caudate	0.18	0.03	-0.38*	-0.30
	Beta: MTG	0.21	-0.12	-0.28	-0.28
	FC: Claustrum–Caudate	0.06	-0.02	0.07	0.27
	FC: Claustrum–MTG	0.12	-0.08	-0.28	-0.22
	FC: Caudate–MTG	0.22	-0.03	-0.27	-0.23

Notes: The table reports Pearson correlation coefficients (r). * $p < .05$.

Table S2. ANOVA results for emotion and familiarity of video material ($M \pm SD$)

	Positive emotion	Negative emotion	Pleasure level	Arousal level	Familiarity
Short video (n=17)	2.58±0.71	1.19±0.32	4.88±1.58	4.47±1.33	2.29±1.40
Long video (n=17)	2.39±0.89	1.15±0.17	5.18±1.81	3.47±2.15	2.18±1.51
<i>F</i>	0.577	0.316	0.274	2.325	0.191
<i>p</i>	0.632	0.813	0.844	0.083	0.902

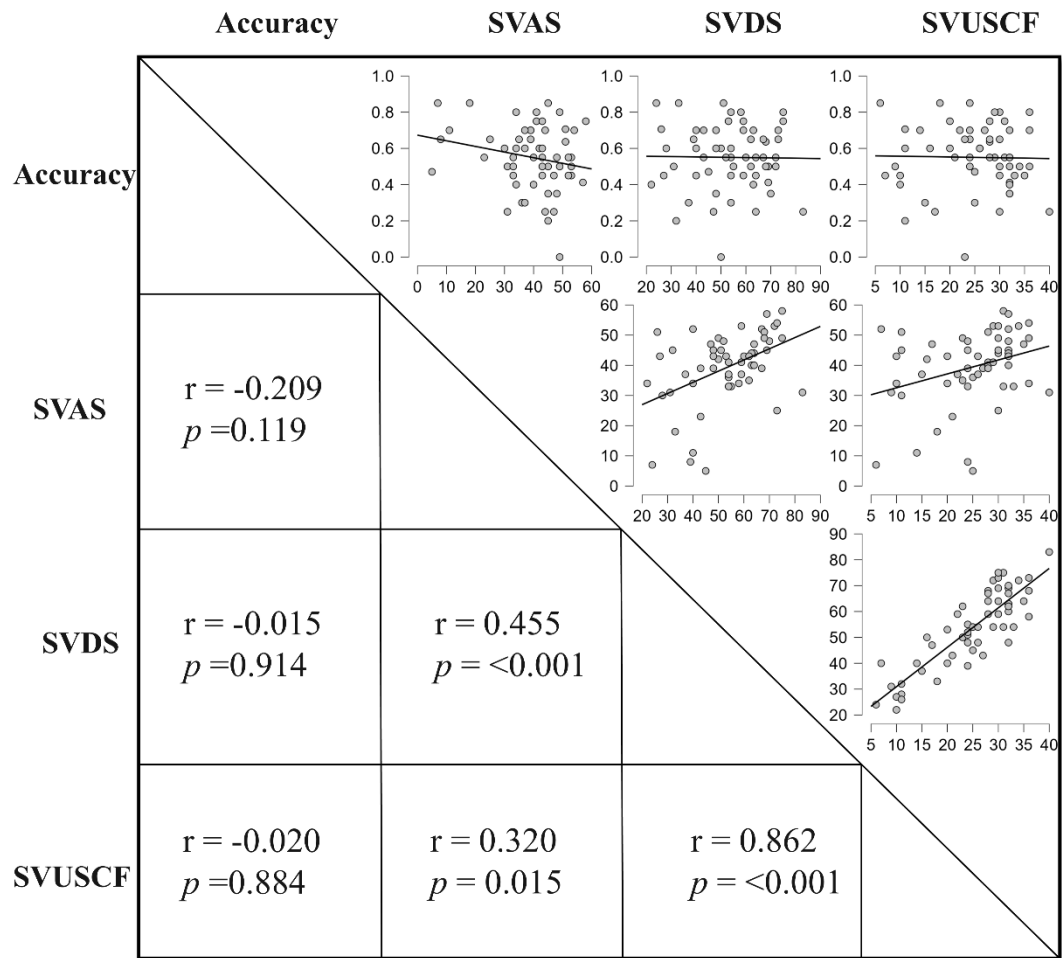


Figure S1. Pearson's correlations among memory accuracy and behavioral measures

Abbreviations: SVAS = Short video addiction scale; SVDS = Short video dependence scale; SVUSCF= Short video usage self-control failure.

References

- Huang, L., Yang, T., & Ji, Z. (2003). Applicability of the positive and negative affect scale in Chinese. *Chinese Mental Health Journal*, 1, 54–56.
- Li, X., Fu, X., & Deng, G. (2008). Preliminary application of the abbreviated PAD emotion scale to Chinese undergraduates. *Chinese Mental Health Journal*, 5, 327–329.