

Physiological Responses to Personalized TikTok Content: Evidence from Pupil Size and Eye Blink Rate

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Abstract

Background:

Personalized social media platforms rely on algorithmic curation to increase user engagement, yet the physiological mechanisms underlying this process are not well understood. This study investigated whether personalized TikTok content influences ocular markers of engagement, specifically pupil size and spontaneous eye blink rate, in a healthy sample.

Methods:

A within-subject design was used in which participants viewed both personalized videos (from their own TikTok feed) and non-personalized videos (from a novel account). Eye tracking was employed to record pupil size and spontaneous eye blink rate during video viewing. Differences between conditions were analyzed using within-subject statistical comparisons. Exploratory analyses examined associations between physiological measures and individual differences, including habitual TikTok use, daily usage duration, follower count, and self-reported enjoyment.

Results:

Pupil size was significantly larger during personalized compared to non-personalized video viewing, indicating increased arousal-related engagement for personalized content. In contrast, spontaneous eye blink rate did not differ between conditions. Exploratory analyses did not reveal consistent associations between physiological measures and individual usage variables.

Conclusions:

Viewing personalized TikTok content was associated with larger pupil size than viewing non-personalized content, consistent with increased arousal-related engagement. The absence of differences in eye blink rate suggests that reward-related processes may not be differentially affected by personalization, or that this measure may lack sensitivity in this context. Because personalized and non-personalized feeds inherently differ in the content selected for each user, the present design cannot distinguish the contributions of specific content characteristics, such as emotional intensity and familiarity, to the observed physiological response. With these limitations in mind, the findings highlight the potential of physiological measures, particularly pupillometry, for studying engagement in digital media environments.

Background

Research suggests that, on average, individuals spend over four hours daily online, and half of that time is on social media (SM).¹ Among all SM platforms, TikTok has the highest engagement rate, capturing attention for an average of 66 minutes a day.² To maintain such levels of engagement, SM platforms rely on algorithmic content curation.³ TikTok's decentralized recommendation system continuously analyzes users' interests to provide personalized content, resulting in high engagement.⁴

Although personalization is central to contemporary social media platforms, relatively little is known about how personalized content affects users' moment-to-moment psychological and physiological states. Engagement is often described in terms of increased arousal, sustained attention, and reward-related processing. These processes have been theoretically linked in prior research to catecholaminergic systems, including noradrenergic and dopaminergic mechanisms.⁵⁻¹¹ However, physiological evidence of the effects of personalization remains scarce.

Personalized Social Media Content and Arousal

Arousal has been linked to activity in the brain's norepinephrine (NE) system, which is primarily regulated by the locus coeruleus (LC).¹²⁻¹⁴ Converging evidence suggests that pupil diameter covaries with LC activity, with modulations in both tonic and phasic LC firing predicting changes in pupil size.¹⁵ Accordingly, increases in pupil diameter are commonly interpreted as reflecting heightened physiological arousal.

Beyond general arousal, pupil dilation has been associated with subjective experiences of interest and emotional engagement. Early work demonstrated larger pupil responses to stimuli of personal interest¹⁶ and subsequent research has shown that emotionally arousing stimuli, whether positive or negative, reliably elicit greater dilation than neutral material¹⁷⁻¹⁸. Together, these findings suggest that pupil size is sensitive to motivationally and emotionally salient content.

Taken together, these findings suggest a link between interest, emotion, arousal, and pupil dilation, with implications for research on personalized SM content. Personalized social media platforms such as TikTok are designed to tailor content to individual users' preferences, thereby increasing subjective relevance and engagement. If pupil dilation indexes interest and arousal-related engagement, personalized content should evoke larger pupil responses than non-personalized content. While prior research has linked social media use to heightened arousal, much of this evidence relies on self-report or downstream outcomes (e.g., sleep disturbances).⁵⁻⁷ By contrast, the present study uses pupil size to assess arousal during moment-to-moment content engagement.

Social Media and Dopamine

In addition to its association with arousal, SM use has also been linked to reward-related processes, and by extension the dopaminergic system. Because dopamine (DA) plays a central role in reinforcement learning, motivational salience, and addictive behaviors, some accounts have suggested that highly engaging platforms may recruit mesolimbic DA circuitry.¹⁹

Empirical evidence for dopaminergic involvement in social media use is mixed and varies in scope. Neuroimaging work has reported altered striatal dopamine transporter binding in individuals with Internet Addiction Disorder⁹ and structural differences associated with problematic social networking use.²⁰ However, such findings stem largely from clinical or extreme-use samples and may not generalize to everyday engagement. In non-clinical populations, lower dopamine synthesis capacity has been associated with greater social media

interaction²¹, suggesting that individual differences in dopaminergic function may shape engagement patterns.

More directly relevant to personalized content, Su et al¹¹ found that viewing personalized TikTok content activated the dopaminergic midbrain regions, including the ventral tegmental area (VTA), with stronger recruitment when content is tailored to user preferences. These findings support the hypothesis that DA circuits are recruited during TikTok engagement, particularly when content is tailored to the user's preferences.

As an additional, indirect approach to study the DA system, spontaneous eye blink rate (EBR) has been proposed, based on early pharmacological, clinical, and animal findings linking blink frequency to DA modulation²²⁻²³. However, evidence for a robust and direct relationship between EBR and DA is mixed: while some studies reported associations with DA receptor activity or reward-related behavior²⁴, others found weak, absent, or context-dependent effects that vary with task demands, baseline DA functioning, or individual differences.²⁵⁻²⁸ Taken together, these findings suggest that, unlike pupil size as an index of arousal, EBR provides at best an indirect and context-sensitive marker of DA-related processes, requiring cautious interpretation in the context of social media research. Given that EBR was recorded alongside pupil size, the primary measure of this study, an analysis of EBR's association with personalized TikTok content may also be informative.

Hypotheses

Taken together, we made two primary predictions. First, we made the directional prediction that if personalized TikTok content increases arousal-related engagement, pupil size should be larger when participants view personalized compared to non-personalized videos. Second, we examined whether spontaneous EBR, as a suggested indirect and context-sensitive marker of reward-related dopaminergic functioning, differs between personalized and non-personalized content. Given the mixed evidence regarding the strength and direction of EBR–dopamine associations in healthy populations, this analysis was more speculative and non-directional. In addition, we explored whether individual differences in habitual TikTok use, daily usage duration, follower count, and reported enjoyment were associated with pupil size. To test these predictions, we used a within-subject eye-tracking paradigm to assess pupil size and EBR during exposure to personalized and non-personalized TikTok videos in a healthy sample.

Method

Stimuli and Apparatus

Personalized TikTok video content was presented using the Microsoft Edge browser, with participants logged into their TikTok accounts. Non-personalized TikTok video content was shown via the generic TikTok website in Google Chrome, without any login. Both conditions are illustrated in Figure 1. This separation of browsers was intended to keep the personalized and non-personalized conditions clearly distinct while ensuring that the overall viewing experience (e.g., screen size, resolution, and playback quality) remained identical across both conditions.

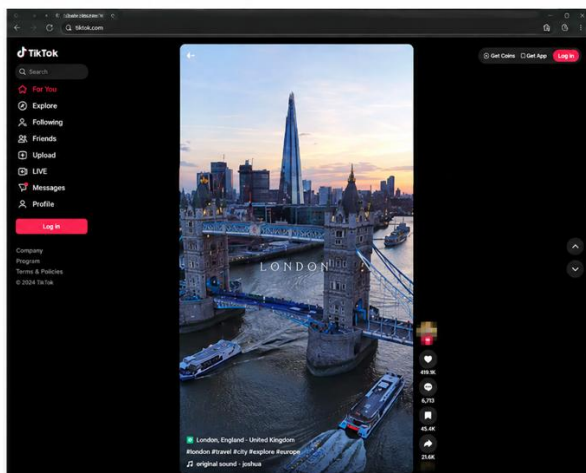
All TikTok video content was presented on a computer monitor, while eye-tracking data, including pupil size and blink events, was recorded using the EyeLink 1000+ eyetracker. To attenuate the influence of luminance variation on pupil size, the f.lux software was installed on the display computer and configured to reduce blue light emission from the screen. This setting applied to the whole display and was therefore the same in both conditions.

Figure 1

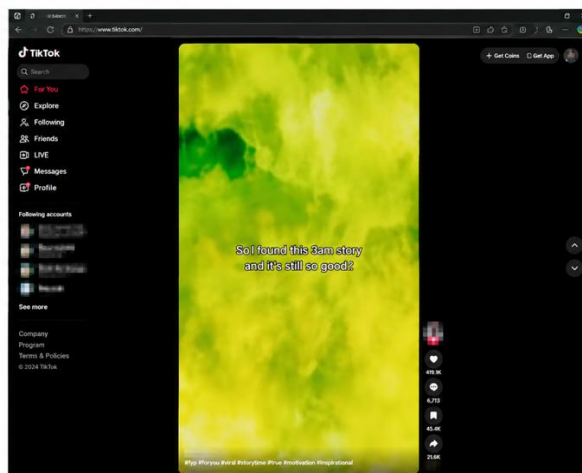
Viewing Environment in the Non-Personalized and Personalized Conditions

A Non-personalized condition

Google Chrome, logged out (generic TikTok website)

**B Personalized condition**

Microsoft Edge, logged in (own TikTok account)



Note. Example screenshots of the TikTok “For You” page as displayed in (A) Google Chrome without login (non-personalized condition) and (B) Microsoft Edge with a TikTok account logged in (personalized condition). Account names, profile pictures, and creator names have been blurred.

Participants

An a-priori power analysis conducted using G*Power indicated that a sample size of 27 participants would be required to detect a medium effect size ($d = 0.5$) with 80% power at $\alpha = .05$, assuming a paired-sample design. Therefore, we aimed to recruit 30 participants. A total of 34 participants (31 female), with a mean age of 19 years (range: 18–23), were tested. Participants were university students recruited through Ghent University's participant recruitment platform, SONA, and received one course credit for the 45-minute session. The study description on SONA stated that participants needed to have their own TikTok account and be able to log into it in the lab. No other eligibility criteria were applied. To support eye-tracking quality and reduce influences on pupil size and blinking, participants were additionally asked to refrain from consuming caffeine on the day of testing, to wear no make-up, and to avoid glasses with black frames. These were requests rather than exclusion criteria. Three of the 34 participants tested were excluded from the analyses based on the data-quality criteria described in the Data Analysis section, leaving a final sample of 31.

We followed the standard ethical procedure required by the Faculty of Psychology and Educational Sciences of Ghent University, as set out in its General Ethics Protocol (available at: https://www.ugent.be/pp/en/research/ec/general_ethics_protocol_fppw.pdf). Under this protocol, formal review by the Faculty's Ethics Committee is required only for studies that meet the mandatory submission criteria defined in its Section 3.1. As the present study did not involve deception, vulnerable populations, or physical or psychological risk, it did not require formal review. The study was conducted in accordance with the principles of the 1964 Declaration of Helsinki and its later amendments. All participants provided written informed consent prior to participation.

Research Procedure

The study followed a within-subjects design, with two main conditions: personalized and non-personalized TikTok content. Each condition included two blocks, resulting in four blocks per participant. The order of conditions was counterbalanced: participants with an odd participant number viewed personalized TikTok video content in blocks 1 and 3, and non-personalized

TikTok video content in blocks 2 and 4; the reverse order was used for even-numbered participants. Each block lasted five minutes.

The experimental procedure was conducted in a dimly lit room, with participants seated comfortably and their heads stabilized using a chin rest. Upon arrival, participants securely logged into their TikTok accounts using a QR code scanner on their mobile device, allowing access to personalized TikTok video content in the Microsoft Edge browser without entering their passwords on the lab computer. This login method ensured both convenience and data privacy.

Participants were informed that the experiment included two viewing conditions (personalized vs non-personalized video content) and were instructed to watch TikTok video content as they normally would at home. Participants could scroll to the next video by pressing the “next video button”, using the down arrow key, or return to a previous video using the “previous video button”, using the up arrow key.

Eye-tracking data was recorded using the EyeLink 1000+ system throughout the experiment, along with video-skipping behavior. Data was captured from the right eye. Before each block, a standard 9-point eye-tracker calibration procedure was used, including a drift correction check. Between blocks, participants were given a 30-second break during which they were asked to fixate on a neutral grey screen. This interval was used to ensure that EBR and pupil size returned to baseline before continuing.

After completing the experimental blocks, participants provided demographic information (age and gender) and completed a short four-item questionnaire on TikTok usage patterns and enjoyment of the platform. The questionnaire was developed by the authors for this study and has not been published elsewhere; an English version is provided as Supplementary Material S1. Usage-related questions were: “How often do you use TikTok?”, “How many hours on average per day do you spend on TikTok?”, “Please enter the number of followers you have on TikTok,” and “How much do you enjoy using TikTok?”. Daily TikTok use was operationalized as the average number of hours per day participants reported using TikTok over the past week and served as a continuous indicator of usage intensity. Habitual TikTok use was measured on a 5-point Likert scale ranging from 0 (Never) to 4 (Daily), reflecting how regularly participants engaged with the platform. In addition, TikTok enjoyment was assessed using a separate 5-point Likert scale ranging from 0 (No enjoyment) to 4 (A great deal of enjoyment).

Data Analysis

To identify outliers in pupil size and EBR, z-scores were calculated for each participant within each condition. Values with an absolute z-score greater than ± 2.5 were considered outliers. One participant exceeded this threshold and was excluded from the dataset. Another participant was excluded due to an extreme discrepancy in EBR between conditions (EBR per minute of 10 in the personalized condition vs. 0.5 in the non-personalized condition), indicating possible non-compliance with the task instructions or bad data due to poor blink detection. One additional participant was excluded due to insufficient data. After these exclusions, 31 participants remained in the final sample.

Pupil size data was linearly interpolated around blink events using a symmetrical ± 90 ms buffer (i.e., a total window of 180 ms surrounding each blink). This was done to exclude contaminated data both immediately before and after the blink and to ensure continuity in the signal during brief data loss (e.g., during blinks). The success of this standard procedure was visually controlled, which was done in a fashion that was blind towards the conditions.

For EBR, eye blink events were detected using EyeLink’s integrated event system, which logs the onset and offset of each blink. Following prior literature,²⁹ only blinks with durations between 160 ms and 1000 ms were retained for analysis, with shorter or longer

252 durations considered noise. Additionally, consecutive short blinks occurring within 500 ms of
 253 each other were merged if their combined duration fell within the 160–1000 ms range. Valid
 254 blinks were then counted and converted into blink rates (blinks per minute).

255 For the main analyses, the dependent variables were pupil size and EBR, respectively,
 256 while the independent variable was the condition (Personalized vs. Non-personalized TikTok
 257 video content). Since both EBR and pupil size were not normally distributed, as indicated by
 258 significant Shapiro-Wilk test results ($p < .05$), nonparametric tests were used. To address
 259 Hypothesis 1 (i.e., larger pupil size for the personalized content condition compared to the
 260 non-personalized condition) a one-sided Wilcoxon signed-rank test was conducted to
 261 compare pupil size across the two conditions. For Hypothesis 2 (i.e., a potential difference in
 262 EBR between the personalized and non-personalized conditions), a two-sided Wilcoxon
 263 signed-rank test was conducted, due to the undirected nature of the hypothesis. Three
 264 participants had identical blink rates in both conditions; as is standard for the Wilcoxon
 265 signed-rank test, these zero-difference pairs were dropped ($n = 28$). For both hypotheses,
 266 Bayes factors (BF_{10}) were additionally calculated to quantify the relative evidence for the
 267 alternative and null hypotheses. All analyses were conducted in R (RStudio version
 268 2024.09.0+375), and Bayes factors were computed using the default priors implemented in
 269 the software.

270 As part of the exploratory analyses, we examined participants' scrolling behavior,
 271 operationalized as the number of "next video" button presses, across content conditions and
 272 blocks. Inspection of the data and a Shapiro-Wilk test indicated that the distribution of scroll
 273 counts did not violate the assumption of normality. Therefore, a paired t-test was used to
 274 compare scrolling behavior across both video conditions.

275 Further, exploratory analyses were conducted to examine the relationship between
 276 TikTok use patterns and pupil size. Specifically, we investigated whether pupil size was
 277 associated with (1) daily TikTok use, (2) frequency of TikTok use, and (3) TikTok follower
 278 count, across both content conditions. In addition, we explored whether these TikTok usage
 279 variables were related to participants' perceived enjoyment of the platform. Given that several
 280 variables were ordinal in nature (e.g., daily TikTok use, frequency of TikTok use, and
 281 enjoyment) and others exhibited non-normal distributions (e.g., follower count), associations
 282 were assessed using Spearman rank-order correlations. Correlation coefficients are therefore
 283 reported as Spearman's ρ .

284 P-values below the conventional threshold of 0.05 were considered statistically
 285 significant. Due to the use of non-parametric tests, effect sizes are reported using r , calculated
 286 as $r = \frac{Z}{\sqrt{N}}$ where Z is the Wilcoxon test statistic and N is the number of observations.
 287

288 Results

289 Descriptive

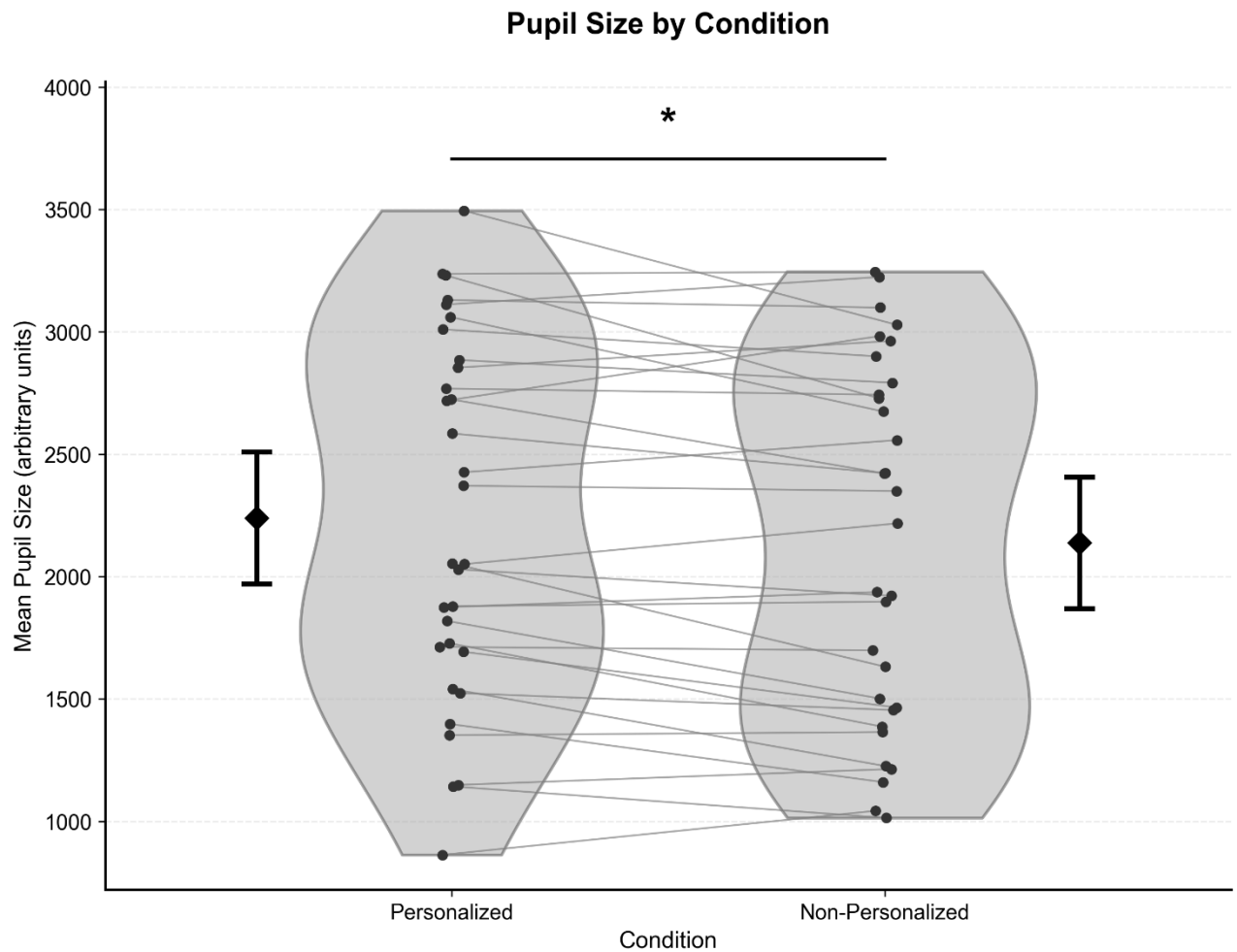
290 In the current study, our sample reported an average TikTok use of 2 hours daily (range = 1-5)
 291 with all but 6 participants indicating everyday use of the app. The average follower count of
 292 our participants amounted to 156 (range = 0 – 1250).

293 Pupil Size

294 Turning to our first main hypothesis, we tested whether pupil size was larger when viewing
 295 personalized TikTok video content compared to video content from a novel account (non-
 296 personalized content). On average, pupil size was indeed significantly larger in the
 297 personalized content condition ($M = 2239.1$, $SD = 736.3$, 95% CI [1969.1, 2509.2]) compared
 298 to the non-personalized condition ($M = 2137.5$, $SD = 732.7$, 95% CI [1868.8, 2406.2], $V =$
 299 365 , $z = 2.29$, $p = .01$, $r = .41$, $BF_{10} = 9.16$), supporting H1 (Figure 2).
 300

Figure 2

Mean Pupil Size by TikTok Video Content Personalization



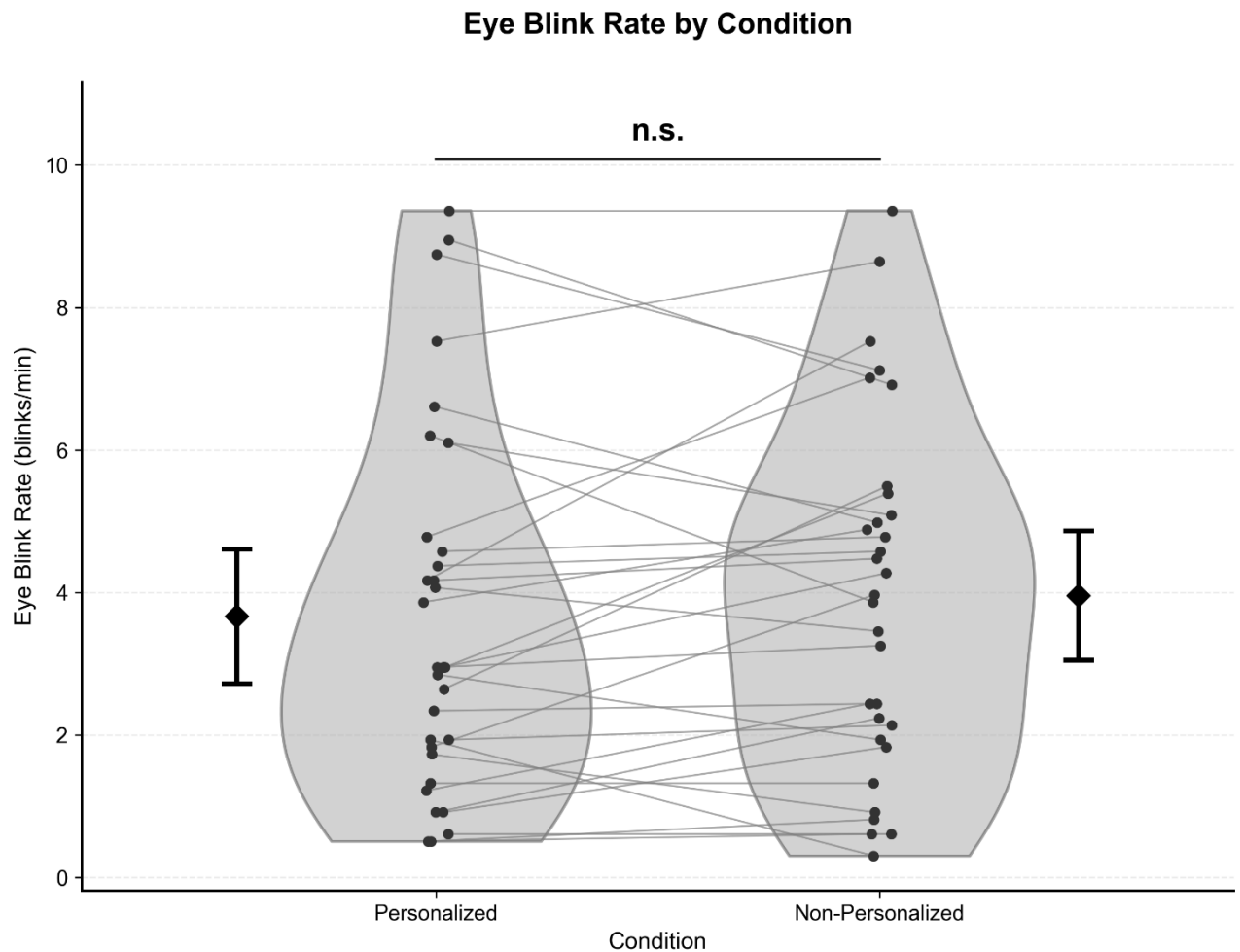
Note. Violin plots show the distribution of participants' mean pupil size (in arbitrary units) for personalized and non-personalized TikTok video content. Dots represent individual participants, and grey lines connect each participant's values in the two conditions. Black diamonds and error bars show the group mean and its 95% confidence interval. The bracket marks the comparison between conditions (one-sided Wilcoxon signed-rank test; an asterisk indicates $p < .05$).

Blink Rate

We investigated whether EBR differed between the personalized and non-personalized TikTok video content conditions. We found that EBR did not significantly differ between the personalized TikTok video content condition ($M = 3.66$, $SD = 2.58$, 95% CI [2.72, 4.61]) and the non-personalized TikTok video content condition ($M = 3.96$, $SD = 2.47$, 95% CI [3.05, 4.86]), $V = 151$, $z = -1.173$, $p = .24$, $r = -.21$, $BF_{10} = 0.35$; Figure 3).

Figure 3

Mean Eye Blink Rate per TikTok Video Content Personalization



Note. Violin plots show the distribution of participants' mean eye blink rate (blinks/minute) in the personalized and non-personalized TikTok video content conditions. Dots represent individual participants, and grey lines connect each participant's values in the two conditions. Black diamonds and error bars show the group mean and its 95% confidence interval (n.s. = not significant; two-sided Wilcoxon signed-rank test).

Exploratory Analyses

Exploratorily, a paired t-test in scrolling behavior, defined as the number of "next video" presses, revealed a non-significant difference between the personalized ($M = 73.10$, $SD = 35.27$, 95% CI [61.10, 86.03]) and non-personalized ($M = 82.26$, $SD = 43.03$, 95% CI [67.71, 97.58]) TikTok content conditions, $t(30) = -1.27$, $p = .21$, $BF_{10} = 0.4$, $d = -0.23$.

The exploratory correlations revealed no significant associations between TikTok use variables (daily use, habitual use, follower count, or perceived enjoyment) and pupil size in either the personalized or non-personalized content conditions (all $ps > .05$). Additional analyses correlating the same TikTok use variables with pupil-size difference (i.e., personalized vs non-personalized) did not reach significance (all $ps > .05$).

Nonetheless, follower count did significantly correlate with perceived enjoyment ($\rho = .41$, $p = .02$). Additionally, the correlation between daily TikTok use and perceived enjoyment also appeared to be significant ($\rho = .40$, $p = .03$). A significant relationship was also observed between habitual TikTok use and perceived enjoyment ($\rho = .55$, $p = .001$), suggesting that the more often the app is used, the more enjoyment one reports from it.

Discussion

The present study aimed to investigate the effects of personalized TikTok video content on physiological markers associated with arousal and reward-related processes. Pupil size was significantly larger during personalized compared to non-personalized content, suggesting heightened arousal-related engagement. In contrast, eye-blink rate (EBR) did not differ between conditions, thereby failing to implicate reward-related processes. Exploratory analyses revealed no significant associations between pupil size and self-reported TikTok use. Still, perceived enjoyment was positively related to how much participants used it, as well as to their follower count.

Pupil Size

The first hypothesis, predicting an increase in pupil size in the personalized content condition, was supported by the results: pupil size was significantly larger during personalized content compared to non-personalized content. This finding aligns with prior work linking pupil dilation to interest and arousal.^{13,16,30} Personalized TikTok videos are algorithmically selected to match users' preferences, and the observed pupil enlargement is consistent with the idea that such tailoring might translate into stronger arousal-related engagement.

These findings also speak to broader claims made by the arousal hypothesis, which posits that consumption of SM content might be problematic for sleep because of increased arousal.⁵⁻⁷ While the current paradigm did not include any direct measurements of sleep, the observed increase in arousal may have implications for sleep, given that factors like heightened arousal and stress are generally associated with poorer sleep quality.³¹ Notably, prior studies using EEG, heart rate, or heart rate variability have yielded mixed support for arousal-based accounts of social media effects.^{32,33} The current findings suggest that pupillometry may capture aspects of arousal-related engagement not consistently detected by other physiological measures.

A potential confound in interpreting pupil size differences is variation in video features, such as luminance, as pupil diameter is very sensitive to changes in light intensity.³⁴⁻³⁶ However, because TikTok videos vary widely in brightness and were presented in a random sequence in both conditions and across participants, large systematic luminance differences between the personalized and non-personalized conditions appear unlikely. The heterogeneity and random ordering of videos should have minimized consistent brightness biases across conditions. We further tried to attenuate any such effects by reducing the amount of blue light, which is particularly relevant for pupillary light adaptations.³⁷ This blue-light filter was applied to the whole display, and thus equally in both conditions.

Another potential confound concerns differences in scrolling behavior across conditions, as more frequent video transitions could introduce additional luminance changes that might influence pupil size. However, exploratory analyses indicated that the number of 'next video' button presses did not significantly differ between the personalized and non-personalized conditions, and Bayesian analysis provided anecdotal evidence in favor of the null hypothesis. This suggests that participants did not systematically scroll more in one condition than the other, making it unlikely that differences in scrolling behavior can account for the observed pupil size differences.

At the neurobiological level, pupil size has frequently been linked to activity in the locus coeruleus–norepinephrine (LC–NE) system.¹²⁻¹⁴ However, converging evidence indicates that pupil dynamics reflect contributions from multiple neuromodulatory systems. For example, Reimer et al.³⁸ demonstrated in mice that both acetylcholine (ACh) and NE activity covary with pupil size, with ACh tracking sustained pupil diameter and NE more strongly associated with rapid changes (with the present data not explicitly dissociating such

effects due to the ongoing nature of the visual stimulation). Human pharmacological studies further support cholinergic modulation of pupil diameter.^{39,40} Moreover, resting-state fMRI work has shown that spontaneous pupil fluctuations correlate with activity across several nuclei of the ascending arousal system, including LC, VTA, substantia nigra, median raphe, and basal forebrain.⁴¹ While the present approach therefore does not permit direct conclusions about any specific neurotransmitter system, the findings are consistent with the notion that personalized content is associated with greater overall arousal-system engagement.

Eye Blink Rate

In contrast to pupil size, EBR did not differ between personalized and non-personalized conditions. One possible explanation concerns the interpretation of EBR as a proxy for DA activity. Although early pharmacological and clinical findings linked EBR to dopaminergic modulations,^{22,23,42,43} more recent work in healthy populations has reported inconsistent or context-dependent associations. For example, Demiral et al²⁶ reported reduced EBR following methylphenidate administration, whereas Dang et al²⁵ found no relationship between baseline DA receptor availability and EBR after DA agonist administration.

Interestingly, participants exhibited generally low EBR across both conditions ($M = 3.81$ blinks per minute), substantially lower than the typically observed resting-state rate of approximately 17 blinks per minute, but comparable to rates observed during cognitively demanding tasks such as reading⁴⁴. Although participants were not informed that EBR was of interest, reducing the likelihood of deliberate blink suppression, prior experience with eye-tracking paradigms cannot be fully ruled out as a potential influence. Moreover, low EBR may generally reflect sustained attentional engagement with TikTok content. Blink inhibition has been shown to occur for visually salient or task-relevant stimuli⁴⁵, with participants reliably blinking less during engaging scenes. From this perspective, both personalized and non-personalized TikTok videos may have been sufficiently engaging to suppress blinking overall, thereby reducing variability between conditions. Interpretation is further complicated by the possibility that EBR also reflects overlapping influences from multiple neuromodulatory systems. For example, cholinergic manipulations have also been shown to affect blink rate.³⁹ In contexts where engagement and reward-related processes co-occur, these influences may operate in opposing directions, complicating straightforward interpretation of EBR as a dopaminergic marker. The present findings therefore underscore the challenges of using EBR as a simple proxy for dopamine-related processes in naturalistic media settings. This is further qualified by the fact that in a Bayesian analysis, we only observed anecdotal evidence for the absence of an effect of content personalization on EBR.

Exploratory Analysis

Scrolling behavior did not significantly differ between conditions, although participants tended to scroll slightly more during non-personalized content. This numerical pattern is consistent with the notion that personalized feeds better match users' interests, reducing the need to actively search for more appealing material, but was not reliably expressed here. This might relate to the short duration of typical TikTok videos. The most popular TikTok videos tend to be between 14 and 16 seconds long⁴, leaving limited time for active scrolling behavior. Such effects could have obscured any condition-based differences that may have been expressed more clearly for longer videos. Still, under the present conditions, one may speculate that the present finding of increased pupil size for personalized content could be a more sensitive marker of engagement (and by extension longer-term use patterns) than behavioral aspects such as scrolling behavior. Importantly, pupil size was not associated with any of the self-reported usage variables in the present sample, so the present data provide no evidence for a link between pupil size and longer-term use patterns.

A significant positive correlation emerged between follower count and self-reported TikTok enjoyment. One possible explanation is behavioral: individuals who enjoy TikTok more may spend more time on the platform, increasing opportunities to accumulate followers,

consistent with the observed associations between enjoyment and both habitual and daily use. Alternatively, follower count may reflect underlying personality traits such as extraversion. Extraverted individuals tend to engage more actively with SM, posting content, interacting with others, and perceiving the platform more positively⁴⁶, behaviors that may facilitate follower growth. Given that extraversion is also associated with positive affect⁴⁷, greater enjoyment may partly reflect dispositional tendencies linked to both social engagement and follower accumulation. In summary, the exploratory analyses presented here sketch a relatively consistent pattern concerning the relationship of different variables related to TikTok use and enjoyment, but without correlating with pupil size, which may indicate that short-term arousal-related engagement is not strongly associated with these more long-term variables.

Limitations

Several limitations should be considered when interpreting the present findings. First, the personalized and non-personalized feed conditions were defined by whether or not participants were logged into their individual account. Coupled with the use of different browsers (Microsoft Edge and Google Chrome) to facilitate this manipulation, this meant that there were several superficial differences between the two displays (Figure 1). For example, the logged-out page showed a log-in button and a shorter navigation menu without the list of followed accounts. Future studies might consider presenting both feeds in the same browser (e.g., using separate browser profiles or incognito browsing for one condition) with identical window layouts.

Second, the videos themselves were not controlled or matched across conditions. This reflects the naturalistic design of the study, in which each participant viewed their own algorithmically curated feed. Consequently, the personalized and non-personalized conditions may have differed systematically in characteristics such as emotional intensity, familiarity (e.g., known creators, formats, or topics), and personal relevance; recognizing previously encountered material has likewise been associated with larger pupil responses⁴⁸. These characteristics are not necessarily independent of personalization, but may represent mechanisms through which algorithmic curation produces increased engagement. The present design therefore does not allow us to determine which specific properties of personalized content contributed to the observed difference in pupil size. Future studies could record and systematically code the videos presented in each condition (e.g., content category, emotional intensity, and familiarity) to disentangle these potential contributions while retaining the naturalistic differences produced by personalization.

Third, our study lacked ecological validity regarding typical TikTok viewing. Specifically, TikTok was viewed in a desktop browser with the head stabilized in a chin rest, which differs substantially from typical smartphone use. Future studies could therefore examine TikTok content under more naturalistic viewing conditions, such as on a smartphone and without head stabilization, to assess whether the present findings generalize to everyday TikTok use.

Conclusion

TikTok is among the most widely used social media platforms worldwide, yet its impact on automatic arousal has remained largely understudied with earlier work based on EEG and cardiac measures yielding inconsistent results. The present study shows that viewing algorithmically personalized TikTok content was accompanied by larger pupil size than viewing non-personalized content, which is consistent with heightened engagement of the ascending arousal system during personalized media consumption. In contrast, eye-blink rate did not differ significantly between conditions, underscoring the complexity of interpreting this measure in healthy populations. Exploratory analyses further indicated that daily, habitual

use and follower count were associated with greater self-reported enjoyment of using TikTok, but not with pupil size. Overall, the findings are consistent with the idea that personalization amplifies moment-to-moment arousal-related engagement, and they identify pupil size as a promising measure in this context. However, because personalized and non-personalized feeds inherently differ in the content selected for each user, the present study cannot determine which specific content characteristics contribute to the observed physiological response; future research could examine these contributions by systematically coding the content presented in each condition. More broadly, the results illustrate both the promise and the limitations of ocular physiological measures for investigating how algorithmically curated digital environments interact with neurocognitive systems involved in attention and arousal.

Declarations

Ethics approval and consent to participate

We followed the standard ethical procedure required by the Faculty of Psychology and Educational Sciences of Ghent University, as set out in its General Ethics Protocol (available at: https://www.ugent.be/pp/en/research/ec/general_ethics_protocol_fppw.pdf). Under this protocol, formal review by the Faculty's Ethics Committee is required only for studies that meet the mandatory submission criteria defined in its Section 3.1. As the present study did not involve deception, vulnerable populations, or physical or psychological risk, it did not require formal review. The study was conducted in accordance with the principles of the 1964 Declaration of Helsinki and its later amendments. All participants provided written informed consent prior to participation.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed during the current study are available in the OSF repository, <https://doi.org/10.17605/OSF.IO/FKAVM>.

Supplementary information

Supplementary Material S1: TikTok Questionnaire (.pdf). English version of the four-item questionnaire on TikTok use that was developed for this study.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

HY contributed to the experimental design, the data collection, the data analysis, and the writing and editing of the manuscript.

NB contributed to the experimental design and the editing of the manuscript.

JE contributed to the experimental design and the editing of the manuscript.

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Not applicable

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778 Additional Information

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